

# CHAPTER II

## STREETS

### 210 STREET DESIGN

#### 210.1 Subgrade Elevation

Soil testing to obtain the strength of the soil is required for all roads and streets in order to analyze and design the structural section. Soil tests are needed on undisturbed samples of the subgrade materials that are expected to be within three (3) feet of the planned subgrade elevation. Samples are needed for each five hundred (500) feet of roadway and for each visually observed soil type. Soil tests are required from a minimum of three (3) locations.

The selected design structural strength of the soil needs to be consistent with the subgrade compaction requirements. The strength and compaction moisture content, at optimum to slightly over optimum, needs to be specified. The soils report shall address subgrade drainage and ground water considerations for year round conditions. Recommendations for both summer and winter construction shall be included. The required density of treated and untreated subgrade materials shall not be less than 95 percent maximum density as determined by AASHTO T-99.

#### 210.2 Structural Section

The following materials may be used for street structural section construction. The structural section type shall not change between major intersections; only one type of section shall be used. At transitions between asphaltic and portland cement concrete structural sections, appropriate portland cement concrete impact slabs shall be designed and installed. Special pavement types and/or conditions are to be approved by the City Engineer.

- A. Full depth asphaltic concrete.
- B. Asphaltic concrete with crushed rock base or treated bases.
- C. Portland cement concrete with cushion course of crushed rock or on a base of crushed rock or treated base.

##### 210.2.1 Aggregate Base

All aggregate shall meet Oregon State Highway Division (OSHD) specifications for base rock.

The minimum aggregate section, unless otherwise approved by the City Engineer, shall be an 8-inch base course of 1 1/2 - 0 inch with a 2-inch leveling course of 3/4 - 0 inch. This equals a total minimum section of 10 inches of aggregate.

During compaction, materials shall be maintained within two (2) percent of the optimum moisture content. The contractor shall begin compaction of each layer immediately after the material is spread, and continue until a density of not less than 95 percent of the maximum density has been achieved. Maximum density will be determined by AASHTO T-180, or OSHD TM-106.

### **210.2.2 Asphalt Concrete Pavement Design and Construction**

- A. Asphalt concrete (AC) pavement shall be designed and constructed per the ODOT/APWA standards, except as modified herein.

The base course of asphalt concrete streets shall be a minimum of 2 inches of 3/4-inch Dense Graded Hot Mix Asphalt Concrete (HMAC) and the wearing course shall be 1-1/2 inches of 1/2-inch Dense Graded HMAC for a total minimum thickness of 3-1/2 inches placed in two (2) lifts. For asphalt thickness greater than 3-1/2 inches, no single lift shall be applied in excess of 2-1/2 inches.

The mix design level of the HMAC shall be based on the traffic loads as follows:

- Level 1 – For use on residential driveways, shared-use paths, hiking trails, and other recreational uses.
- Level 2 – For use primarily on local streets, neighborhood routes, and collector streets where the 20-year equivalent single axle loads (ESALs) are less than 1 million. May also be used on arterial streets where single axle loads (ESALs) are less than 1 million
- Level 3 – For use primarily on arterial streets where the 20-year ESALs range from 1 to 10 million.

The specific grade of asphalt cement shall be PG-70-22 Performance Graded Asphalt (AASHTO MP-1) as approved by the City Engineer.

Asphalt pavement shall be designed using any nationally recognized procedure; both the AASHTO Design Procedure as defined in the *ODOT Pavement Design Guide* (replaces ODOT's former *OSHD Design Procedure*) and the Asphalt Institute methods are discussed below.

The compaction shall be at least 91 percent based on a Rice theoretical maximum density, as determined in conformance with AASHTO T 209, as modified by OSHD. In addition, for Level 1 and 2 mixes, a 50 blow Marshall (AASHTO T 245) and for Level 3 mix a 75 blow Marshall (AASHTO T 245) or Superpave Performance Testing as outlined in the ODOT *Contractor Mix Design Guidelines for Asphalt Concrete* shall be performed and all related test data shall be provided to the City Engineer. The minimum “Tensile Strength Ratio,” “voids filled with asphalt,” “voids in mineral aggregate,” and “air voids” shall be according to the *ODOT/APWA Oregon Standard Specifications for Construction*. The Marshall requirement may be waived by the City Engineer on a case-by-case evaluation.

Any asphalt concrete pavement lift with an average in-place relative density between 90 percent to 91 percent shall require a three year Maintenance Warranty (in an amount equal to 100 percent of the cost of removing and replacing the asphalt). (If no single lift averages less than 89 percent, then all lifts shall be averaged together.) If the average in-place relative density for any lift falls between 89 percent and 90 percent inclusive, a five year Maintenance Warranty (in an amount equal to 100 percent of the cost of removing and replacing the asphalt) shall be required. If the average density is less than 89 percent, then the asphalt shall be deemed unacceptable, and will be rejected. The Engineer of Record shall then submit to the City Engineer for approval a plan to remove and replace the asphalt that was rejected.

Asphalt concrete shall be placed on a dry prepared surface. For the base lift, the surface shall be not less than 45 degrees Fahrenheit, without the adjustment for the wind chill factor, and not less than 40 degrees Fahrenheit, with the adjustment for the wind chill factor. For the top lift, the surface temperature shall be not less than 50 degrees Fahrenheit, without the adjustment of the wind chill factor, and not less than 45 degrees Fahrenheit, with the adjustment for the wind chill factor.

#### B. Asphalt Institute Method

The Asphalt Institute Method is the City’s preferred design method. Design of asphalt concrete pavement structures by this method shall conform to the guidelines of the Asphalt Institute Publication, *Thickness Design – Asphalt Pavements for Highways and Streets, Manual Series No. I*.

- AASHTO T-193 (CBR method), or
- AASHTO T-190 (R-value Method).

If the CBR value of the subgrade exceeds twenty (20) or the R value of the subgrade exceeds sixty (60) then CBR and R-value methods shall not be used.

#### C. AASHTO Design Procedure (Replaces the former Oregon State Highway Division Method)

The design engineer shall adhere to the AASHTO Design Procedure in accordance with the *ODOT Pavement Design Guide*.

#### D. Design Considerations

Design parameters used in the pavement design procedure shall be appropriate for the particular design. The design engineer is responsible for selecting design input values and for obtaining assistance when necessary from the ODOT Pavement Services Unit or Asphalt Institute Portland District Engineer, as applicable.

For all asphalt concrete pavement designs, use fabric mat where moisture is present in the subgrade, or use fabric mat plus excavate an additional 12 inches and replace with rock for unusually wet subgrade conditions.

#### **210.2.3. Asphalt Overlay Design and Construction**

Pavement overlays and inlays shall be designed and constructed in accordance with the City's current overlay specifications, available from the City Engineer by request.

#### **210.2.4 Portland Cement Concrete Pavement Design**

The design of portland cement concrete streets shall be governed by the guidelines and requirements of the Portland Cement Association (PCA) design procedures found in the the following publications: *Concrete Streets: Typical Pavement Sections and Jointing Details (IS211.01P)*; *Thickness Designs for Concrete Highway and Street Pavements (EB109.01P)*; and, *Joint Design for Concrete Highway and Street Pavements (IS059.03P)*, the applicable ACI standards, and the *Oregon Standard Specifications for Construction*, whichever are deemed most stringent by the City Engineer.

The subgrade shall be tested to determine the Modulus of Subgrade Reaction,  $k$ , in order to design the street structure. A correlation of CBR to  $k$  may be made using Figure 2, *Thickness Designs for Concrete Highway and Street Pavements*. In addition, the City will require that the following be incorporated into the design and construction:

1. Use a minimum twenty (20) year design period.
2. Minimum thickness of portland cement concrete shall be five (5) inches.
3. Concrete shall meet the specifications for "Structural Concrete" and the classes of Structural Concrete described in the "*Materials*" section of the *Oregon Standard Specifications for Construction*, except that the City requires Structural Concrete (not Structural Concrete Option A) regardless of the total quantity of concrete for the Project. The minimum design compressive strength for concrete pavement shall be

5000 psi (Class 5000 – 1 ½ concrete) in 28 days, and the minimum flexural strength for pavement shall be 650 psi in 28 days. The minimum cement content will be 660 pounds per yard, with a maximum water / cement ratio of 0.40. The slump shall range from 3-inch to 4-1/2-inch. The entrained air shall be from 4.0 to 6.0 percent. Concrete for bridges shall be as specified for “Concrete Bridges” in the *Oregon Standard Specifications for Construction*.

4. A design joint plan shall be prepared and incorporated into the street construction plans. Longitudinal and transverse joint locations shall be clearly delineated. Transverse joints shall be skewed forward two (2) feet per lane with right and left curb street stationing noted for each end. Joint spacing (in feet) should not exceed 1.5 to 1.75 times the slab thickness (in inches). For example, an 8-inch thick slab would have a maximum joint spacing of 12 to 14 feet. The maximum length to width ratio shall be 1.25: 1.0 for any panel unless there are other constraints that the City will examine on a case-by-case basis.

Longitudinal joints shall be sawed at the same time or immediately following the transverse joints. Joints shall be sawed 0.25 inches in width and to a depth of at least one-third the slab thickness. Sawing shall occur as early as possible, especially when large changes in temperatures are expected.

5. At no time shall construction equipment or traffic be allowed on the new pavement until laboratory tests indicate at least 95 percent design strength has been attained, a minimum of seven days have passed since placement, or both the City Engineer and the design engineer agree that the street is ready for traffic and construction loads.

All joints shall be sealed. The concrete surfaces to which joint sealant will be applied must be clean and dry. To some degree, the technique or combination of techniques selected to accomplish this will depend on the conditions encountered in the field. Saw cutting (old joints), high pressure water jetting, sand blasting, wire brushing, and blowing out the joint with compressed air are methods that can be used. Air compressors used for this purpose must be equipped with traps capable of removing moisture and oil from the air. All residues must be removed from the joint that might prevent bonding of the joint sealant material. A 3/8-inch diameter, closed-cell, expanded polyethylene foam backer rod shall be placed in the joints according to the joint sealant manufacturer's recommendations. The joints shall be sealed with a hot rubber asphalt sealant (ASTM D3405 spec.) or Dow Corning 888 silicone sealant (or equivalent as determined by ASTM D1475, ASTM D3583, ASTM C719, and ASTM D793 spec.) and placed as per the manufacturer's specifications. The sealant type to be used shall receive approval from the City Engineer and be noted on the design joint plan. The surface of the sealant should be 1/4-inch beneath the surface of the pavement. All excess materials shall be removed from the surface.

6. The field testing of Portland cement concrete pavement shall follow the procedures for field testing concrete pavement listed in the *ODOT Manual of Field Test Procedures, 2002 Revision*. Those procedures are as follows:

ODOT TM 770	Determining the Graphic Profile Index with a Profilograph
ODOT TM 775	Non-destructive Depth Measurement of Concrete Pavement
AASHTO T 22	Compressive Strength of Cylindrical Concrete Specimens
AASHTO T 23	Making and Curing Concrete Test Specimens in the Field
AASHTO T 119	Slump of Hydraulic Cement Concrete
AASHTO T 121	Mass per Cubic Meter, Yield, and Air Content of Concrete
AASHTO T 152	Air Content of Freshly Mixed Concrete by the Pressure Method
AASHTO T 231	Capping Cylindrical Concrete Specimens
AASHTO T 309	Temperature of Freshly Mixed Concrete
WAQTC TM2	Sampling Freshly Mixed Concrete

7. All other testing shall follow ACI and ODOT procedures, except as otherwise specified herein. In cases of conflict or disagreement between procedures, the City Engineer shall determine which govern.
8. The statistical analysis and interpretation of the results from the above tests, and the application of said test results to acceptance or rejection of portland cement concrete pavement, shall be as specified in the applicable ACI standards and the *Oregon Standard Specifications for Construction*, whichever are deemed the most stringent by the City Engineer.

### **210.3 Horizontal Alignment**

Alignments shall meet the following requirements:

- A. Center line alignment of improvements should be parallel to the center line of the right-of-way.
- B. Center line of a proposed street extension shall be aligned with the existing street center line.
- C. Horizontal curves in alignments shall meet the minimum radius requirements as shown in Table II-a.

Reversing horizontal curves shall be separated by no less than 50 feet of tangent. On arterials, the separation shall be no less than 100 feet.

**TABLE II a – DESIGN SPEED / CENTER LINE RADIUS – MINIMUMS**

DESIGN SPEED (MPH)	FRICTION FACTOR (F)	MINIMUM CURVE RADIUS (FT.) FOR VARIOUS CROSS SLOPES				
		(e) - 2.5%	(e) 0%	(e) 2.5%	(e) 4%	(e) 6%
15	0.330	50	45	45	40	40
20	0.300	100	90	85	80	75
25	0.252	185	165	150	145	135
30	0.221	305	275	245	230	215
35	0.197	475	415	370	345	320
40	0.178	700	600	525	490	450
45	0.163	980	830	720	665	605

**Notes:** For Table II a - off right-of-way runoff shall be controlled to prevent concentrated cross flow in superelevated sections. The above tables are to be used unless otherwise directed by the City Traffic Engineer.

Superelevations will be required as directed by the City Traffic Engineer. Where superelevation is used, street curves should be designed for a maximum superelevation rate of 4 percent. If terrain dictates sharp curvature, a maximum superelevation of 6 percent is justified if the curve is long enough to provide an adequate super elevation transition.

On local streets, requests for design speeds less than 25 miles per hour shall be based on topography, right-of-way, or geographic conditions, which impose an economic hardship on the applicant. Requests must show that a reduction in centerline radius will not compromise safety. There will be posting requirements associated with designs below 25 miles per hour.

Source: American Association of State Highway and Transportation Officials, *A Policy on Geometric Design of Highways and Streets 2001*, Fourth Edition. (Standards for Low-Speed Urban Streets).

## **210.4 Vertical Alignment**

Alignments shall meet the following requirements:

- A. Minimum tangent street gradients shall be one-half (0.5) percent along the crown and curb.
- B. Maximum street gradients shall be fifteen (15) percent for local streets and neighborhood routes, and ten (10) percent for all other streets. Grades in excess of fifteen (15) percent must be approved by the City Traffic Engineer on an individual basis.
- C. Local streets intersecting with a neighborhood route or greater functional classification street, or streets intended to be posted with a stop sign, shall provide a landing averaging

five (5) percent or less. Landings are that portion of the street within twenty (20) feet of the projected curb line of the intersecting street at full improvement.

- D. Grade changes of more than one (1) percent shall be accomplished with vertical curves.
- E. At street intersections, the crown of the major (higher classification) street shall continue through the intersection. The roadway section of the minor street will flatten to match the longitudinal grade of the major street at the projected curb line.
- F. Street grades, intersections, and super elevation transitions shall be designed to not allow concentrations of storm water to flow across the travel lanes.
- G. Off-set crowns shall be allowed only with the specific prior approval of the City Traffic Engineer and must conform to the Standard Drawing for off-set crowns.
- H. Slope easements shall be dedicated or obtained for the purposes of grading outside of the right-of-way.
- I. Streets intersected by streets not constructed to full urban standards shall be designed to match both present and future (as far as practicable) vertical alignments of the intersecting street. The requirements of this manual shall be met for both present and future conditions.

When new streets are built adjacent to or crossing drainage ways, the following standards shall govern the vertical alignment:

**Functional Classification**

**Vertical Standard**

Freeways  
and Arterials

Travel lanes shall be at or above the 100 year flood elevation.

Collectors

Travel lanes shall be at or above the 50 year flood elevation but not lower than 6 inches below the 100 year flood elevation.

Neighborhood Routes and  
Local streets (residential)

Travel lanes shall be at or above the 25 year flood elevation but not lower than 6 inches below the 100 year flood elevation.

Local streets  
(non-residential)

Travel lanes shall be at or above the 25 year flood elevation but not lower than 6 inches below the 50 year flood elevation.

If alternate access is available for properties served by a particular local street, a design could be considered for approval by the City Engineer that would set the travel lanes at or above the 10 year flood elevation but not lower than 6 inches below the 25 year flood event.

Vertical curves shall conform to the values found in Table II b.

**Table II b – DESIGN CONTROLS FOR CREST AND SAG VERTICAL CURVES**

DESIGN SPEED (MPH)	MINIMUM RATE OF VERTICAL CURVATURE, K	
	CREST	SAG
15	3	10
20	7	17
25	12	13
30	19	19
35	29	26
40	44	34
45	61	44

Source: American Association of State Highway and Transportation Officials, *A Policy of Geometric Design of Highways and Streets 2001*, Fourth Edition.

Table II-b assumes that street lighting exists. The City Traffic Engineer may require a higher K value for sag vertical curves if the roadway will not be lighted.

### 210.5 Intersection Sight Distance Policy

It is the policy of the City of Beaverton to have the applicant's Project Engineer evaluate safe intersection sight distance using the principles and methods recommended by AASHTO. This policy shall apply to the design of new streets and driveways, and to the placement of any object in the public right-of-way, including landscaping features. The following minimum standards shall apply:

**Intersection (and Driveway) Sight Distance:** The following table is for intersection and driveway sight distances:

**TABLE II C - INTERSECTION SIGHT DISTANCE**

DESIGN SPEED (MPH)	MINIMUM INTERSECTION SIGHT DISTANCE (FEET)
15	145
20	195
25	240
30	290
35	335
40	385
45	430

Source: American Association of State Highway and Transportation Officials, *A Policy of Geometric Design of Highways and Streets 2001*, Fourth Edition, (based on AASHTO Case B2 and B3).

Sight distance shall be determined for each street approach to an intersection. A driver on the approach street should be able to see each vehicle on the intersecting street from the time that the vehicle is the sight distance from the intersection until the time that the vehicle reaches the intersection. Poles, trees, and similar obstructions will be allowed within the sight distance area only if it can be shown that such obstructions do not prevent the continuous view of the vehicle approaching on the intersecting street.

For purposes of this calculation, the driver's eye is assumed to be 15 feet from the near edge of the nearest lane of the intersecting street, and at a height range of 3.5 feet to 7.6 feet above the approach street pavement. The sight distance criteria should be met throughout the range of driver's eye heights. The top of the vehicle on the intersecting street is assumed to be 3.5 feet above the cross-street pavement.

The traffic speed used in the calculation shall be the highest of the following: (1) the design speed of the intersecting street; (2) the posted speed of the intersecting street; or (3) the measured 85<sup>th</sup> percentile speed of the intersecting street. Where the intersecting street is controlled by a stop sign or yield sign, a design speed of zero may be assumed. Where traffic signal control exists at an intersection or where a traffic signal is likely to be installed in the future, adequate sight distance shall be provided for potential right turns on red.

In some locations, maintenance of the required sight distance may require restrictions to potential development outside the public right-of-way. If so, the Project Engineer shall demonstrate that adequate restrictions are in place (and enforceable by the City) to assure that the required sight distance can be maintained in the future.

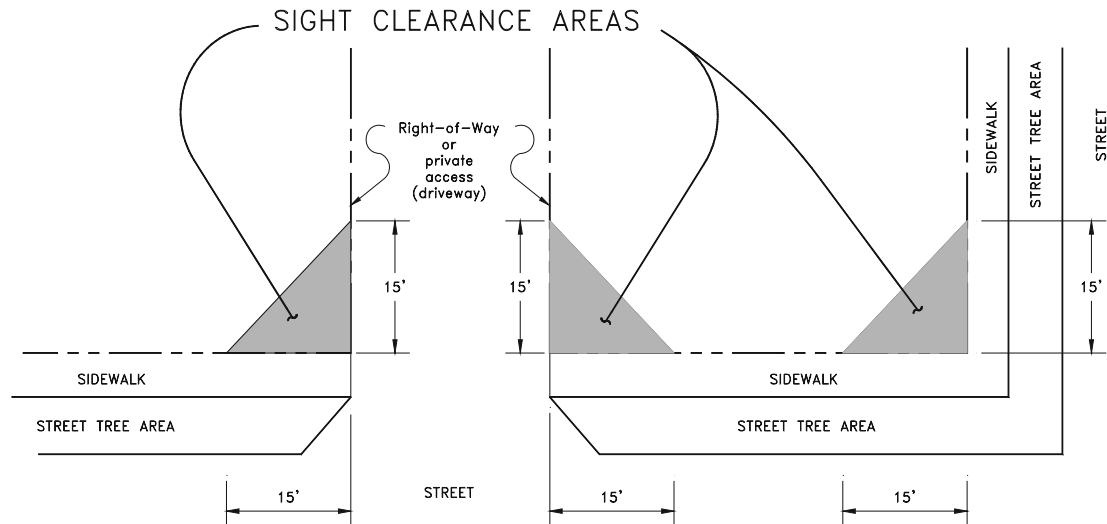
No modifications or exceptions to these standards shall be allowed unless approved by the City Traffic Engineer.

### **210.5.1 Visibility at Intersections**

All work within the public right-of-way and adjacent to public streets and accessways shall comply with the standards of this section.

1. Except as otherwise provided in this section, no fence, berm, wall, vehicle, hedge or other planting or structure shall be erected, planted, placed, or maintained within a sight clearance area. If the relation of the surface of the lot to the streets is such that visibility is already obscured, nothing shall be done to reduce visibility within the sight clearance area.
  - a. The horizontal limits of the sight clearance area shall be a triangular area measuring 15 feet along the right-of-way or private access, as shown in the following diagram. The edge of the hard surfaced area of the private access, be it

roadway, curb, or sidewalk, shall be treated as the right-of-way line in determining the site clearance areas.



- b. The vertical limits of the sight clearance area shall be two planes. The lower plane shall intersect the right-of-way line at points three (3) feet above the elevation of the centerline of the adjoining street. The upper plane shall intersect the right-of-way line at points ten (10) feet above the elevation of the centerline of the adjoining street.
- c. Poles, tree trunks, and similar objects less than 12 inches in width may be allowed in the sight clearance area if such objects meet the intersection sight distance requirements.
- d. No modifications or exceptions to these standards shall be allowed unless approved by the City Traffic Engineer.

## 210.6 Intersections

- A. The interior angle at intersecting streets shall be kept as near to 90 degrees as possible and in no case shall it be less than 75 degrees. A straight horizontal alignment (no curves, no angle points) shall be used through the intersection and for a minimum of 25 feet each side of intersecting right-of-way lines.

- B. Curb radii at intersections shall be as shown in Table II d for the various functional classifications. The right-of-way radii at intersections shall be sufficient to maintain at least the same right-of-way to curb spacing as the lower classified street.

**Table II d - MINIMUM CURB RADII AT INTERSECTIONS (in feet)**

STREET CLASSIFICATION	ARTERIAL	COLLECTOR	NEIGHBORHOOD ROUTE	LOCAL
Arterial	See Note 3	See Note 3	See Note 2	See Note 2
Collector	See Note 3	See Note 3	See Note 2	See Note 2
Neighborhood Route	See Note 2	See Note 2	See Note 1	See Note 1
Local	See Note 2	See Note 2	See Note 1	See Note 1

**Note 1:** Except in areas zoned for industrial uses, the intersections of local streets and neighborhood routes shall have a minimum curb radius of 15 feet. In areas zoned for industrial uses, the minimum curb radius shall be 30 feet.

**Note 2:** The intersection of a neighborhood route or local street with an arterial or collector street shall have a minimum curb radius of 25 feet. In areas zoned for industrial uses, the intersection of a neighborhood route or a local street with an arterial or collector street shall be designed to accommodate a WB-50 Semitrailer Design Vehicle and the curb alignment shall be designed so that the vehicle can complete a right turn using only the vehicle lanes nearest to the curbs of the two streets. See Note 4.

**Note 3:** At an intersection where each street is an arterial or a collector, the intersection shall be designed to accommodate a WB-50 Semitrailer Design Vehicle. If either street is designated as a Truck Route in the *Comprehensive Plan Transportation Element*, the intersection shall be designed to accommodate a WB-65 Interstate Semitrailer Design Vehicle. The curb alignment shall be designed so that the vehicle can complete a right turn using the vehicle lane nearest to the curb on the approach street and using all available lanes in the direction of travel on the departure street. See Note 4.

**Note 4:** Curbs should be designed to minimize the length of pedestrian crossings. Designers are encouraged to consider curb alignments with compound curves and other methods to minimize the intersection width needed to satisfy Notes 2 and 3. Parking lanes and bicycle lanes may be included in considering the effective width available to accommodate the turning design vehicle.

- C. The radii standards in subsection 210.6 B. may also be applied by the City Traffic Engineer to driveways.
- D. Sidewalk access ramps shall be provided at all corners of all intersections, regardless of curb type, and shall conform to the Standard Drawings in Chapter VIII.

E. Intersection Spacing Along Streets. The minimum and maximum distance between streets shall be as follows:

STREET FUNCTIONAL CLASSIFICATION*:	DISTANCE BETWEEN INTERSECTIONS ALONG THE STREET SHALL BE AT LEAST:	DISTANCE BETWEEN INTERSECTIONS ALONG THE STREET SHALL NOT EXCEED:
<b>Arterial</b>	600 feet	1000 feet
<b>Collector</b>	200 feet	530 feet
<b>Neighborhood Route</b>	100 feet	530 feet
<b>Local</b>	100 feet	530 feet

\* Street Functional Classifications are identified in the *Comprehensive Plan Transportation Element* Figure 6.4.

1. Distance between streets is measured from the near side right-of-way line of the subject street to the near side right-of-way line of the adjacent street.
2. Local street connections at intervals of no more than 330 feet should apply in areas planned for the highest density mixed-use development.

### 210.7 Cul-de-sacs, Eyebrows, Turnarounds

The following specifies the minimum requirements for cul-de-sacs, eyebrows, and turnaround areas. Other turnaround geometrics may be used when conditions warrant and City Engineer approves the design and application of its use.

- A. Cul-de-sacs, eyebrows, and turnaround areas shall be allowed only on local streets and commercial/industrial streets.
- B. Cul-de-sacs shall not be more than 200 feet in length, except for the modified infill design cul-de-sac, which shall not be more than 150 feet in length. The length of a cul-de-sac shall be measured along the center line of the cul-de-sac from the near side right-of-way of the nearest through traffic intersecting street to the farthest point of the cul-de-sac right-of-way. See the standard drawings for cul-de-sac right-of-way and pavement requirements in Chapter VIII.
- C. The minimum curb radius for transitions into cul-de-sac bulbs shall be 25 feet, and the right-of-way radius shall be sufficient to maintain the same right-of-way to curb spacing as in the adjacent portion of the road.
- D. An eyebrow corner may be used on a local street where expected ADT will not exceed 500 vehicles per day or as otherwise approved by the City Traffic Engineer. Minimum curb radius on the outside of an eyebrow corner is 36 feet; minimum right-of-way radius is 45 feet. Eyebrow geometry shall be evaluated on the basis of turning requirements for

Fire Department vehicles. The minimum curb radius is the straight line distance measured from the point of intersection of the tangents (of the projected centerline) to the face of the curb (36 feet required), or to the edge of right-of-way (45 feet required).

## 210.8 Driveways

- A. Corner Clearance for Driveways. Corner clearance shall be based on an intersection analysis and shall conform to the following minimum distances:

FOR LOTS FRONTING ON:	DESIGN SPEED (MILES PER HOUR)	MINIMUM DISTANCE BETWEEN FACE OF CURB OF INTERSECTING STREET AND NEAR SIDE EDGE OF DRIVEWAY (FEET)
<b>Arterials and Collectors</b>	25	150
	30	180
	35	180
	40	200
	45	230
	50	350
<b>Neighborhood Routes</b>		50
<b>Local Streets</b>		25

Note: Street Functional Classifications are identified in the *Comprehensive Plan Transportation Element* Figure 6.4.

- B. If the minimum standards in this subsection would prohibit access to the site, a driveway with restricted turn movements acceptable to the City Traffic Engineer may be approved.
- C. Minimum driveway spacing between driveways on arterials and collectors shall also conform to the corner clearance standards of this section.
- D. Driveway Approaches

The City Traffic Engineer has the authority to limit access and access locations. Access to streets and highways under Washington County or State of Oregon jurisdiction must be formally approved by those entities at the applicant's initiative and expense. The following specifies the minimum requirements for driveways:

1. Driveways shall not be permitted on streets with existing or proposed non-access reserve strips.
2. Concentrated surface runoff shall not be allowed to flow over commercial driveways or sidewalks into the street.
3. Driveways shall meet the minimum intersection sight distance requirements.

## **210.9 Curbs, Shoulders, and Grading**

The following specifies the requirements for curbs and cross-slope grading for streets:

- A. All streets shall include curbs on both sides except in the situations of interim width improvements. Interim designs shall have shoulders and ditches.
- B. Interim width streets shall have 6-foot wide shoulders adjacent to the street at a 2-1/2 percent cross-slope and roadside ditches each side of the shoulders with a maximum side-slope of 2 horizontal to 1 vertical. The 6-foot shoulder area may consist of a section of pavement and/or a section of crushed rock. The pavement section shall be a minimum of 2 feet wide and a maximum of 6 feet wide.
- C. Cross-slope of the street section shall be no less than 2.5 percent and no greater than 5 percent. Whenever possible, the crown of the street shall be the same elevation as the top of the curbs.

Grading outside the improved areas shall be as follows:

- A. Collectors or higher functional classifications shall have a maximum 2 percent upward grading to the right-of-way line, and no steeper than 1-1/2 to 1 up, or 2 to 1 down, outside the right-of-way.
- B. Local Street and Commercial/Industrial functional classifications shall have a maximum 2 percent upward grading to the right-of-way line, a 5 to 1 upward or downward grading within the public utility easement, and no steeper than 1-1/2 to 1 up, or 2 to 1 down outside the public utility easement.
- C. Retaining walls shall be used if slopes are greater than the 1-1/2 to 1 requirement in the subsections above or where slope stability is a problem. If slopes are to be maintained (mowed) by the City, a maximum of 3 to 1 slope will be required. Retaining walls shall be constructed to a height where the slope is no more than 1-1/2 to 1.

When new curbing is being placed, a stamp or tag shall be placed to mark where each water and sanitary sewer service crosses the curb line. The method of marking the curb shall be approved by the City Engineer and noted on the approved construction plans. If an imprinting stamp is used, the impression left for a water service shall be the letter "W"; for a sanitary service, it shall be the letter "S". These impressions shall be 2 inches high, placed on the top of the curb. Tags shall be rectangular, three (3) inches in width by two (2) inches in height, stainless steel "INFOTAG" low-temperature tags by InfoSight Corporation and shall be attached to a 36-inch-long #3 re-bar driven 30 inches into the ground over the service line. The tag shall be twist-tied to the re-bar with 10-gauge galvanized steel wire.

## **210.10 Sidewalks**

The following specifies the requirements for sidewalks.

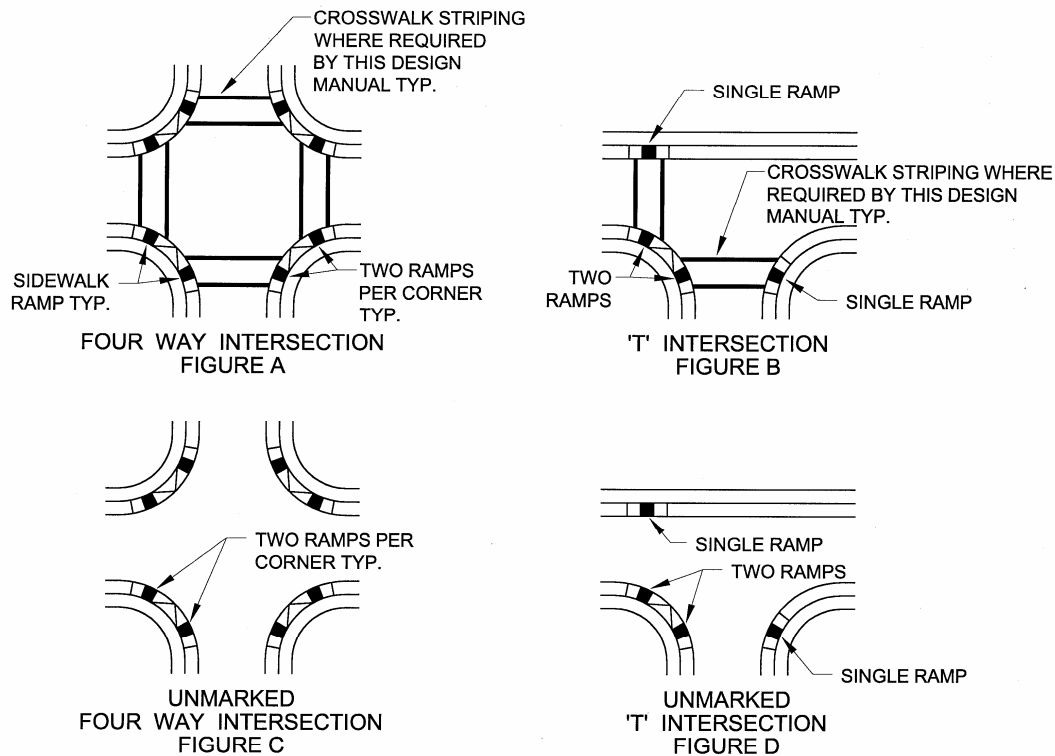
- A. Sidewalks shall be separated from the curb as indicated in the street standards in Chapter VIII, except where physical or topographic conditions make it impracticable to separate the sidewalk from the curb, the City Traffic Engineer may approve a design modification to allow the sidewalk to be adjacent to the curb.
- B. Where clustered mailboxes or other objects larger than single mailboxes are within a sidewalk, the walk shall be widened to provide clearance equal to the required sidewalk width.
- C. In no case shall the sidewalk clear space be smaller than the clear space shown on the applicable standard drawing.
- D. In instances where it is required to install sidewalks and a permanent sidewalk cannot be constructed, a temporary sidewalk may be constructed. The temporary sidewalk may consist of an asphaltic concrete or portland cement concrete to a width, location, and structure approved by the City Engineer.

The following are the minimum requirements for location and construction of sidewalk ramps:

- A. Sidewalk ramps shall be located and constructed in accordance with the rules and regulations of Title III of the Americans with Disabilities Act of 1990 (ADA).
  - B. The City's interpretation of the ADA is that all existing sidewalk ramps abutting a street overlay or pavement reconstruction shall be brought into compliance with the ADA's requirements for sidewalk ramps.
  - C. Crosswalks shall be marked (striped) only at crossings that are protected by a traffic signal, or stop sign, or at other locations recommended by the Traffic Commission and approved by the City Council.
  - D. Ramps located within marked (striped) crossings shall be wholly within the crossing, excluding the flared wings. See Figures A and B.
  - E. At unmarked crossings, ramps may be single (one ramp per street corner) diagonal ramps. See Figures C and D.
  - F. At new Tee intersections, the "cross-bar" of the tee must have at least one crossing equipped with ramps, regardless of whether the crossings are marked or not. Thus, all new Tee intersections shall have at least four ramps, with two ramps on one corner of the
-

intersection. On retrofitted existing Tee intersections, at least two single ramps and a third ramp that may be double or single, depending on whether the crossings are marked (striped) shall be provided unless existing conditions prohibit the double ramp. See Figures B and D.

- G. Location of ramps and the minimum number of ramps per intersection shall be shown on the construction plans in accordance with these specifications and the diagrams that follow.



- NOTES:
1. SIDEWALK RAMPS SHOWN ARE THE MINIMUM NUMBER OF RAMPS REQUIRED.
  2. SEE STANDARD DRAWINGS FOR ADDITIONAL DETAILS OF RAMP DESIGN.

See Standard Drawings in Chapter VIII for ramp details including current ADA requirements.

## 210.11 Raised Medians

Where raised medians are allowed, the following criteria must be met:

- A. The raised median shall be set back at least 2 feet from the median lane on both sides.
- B. Street lighting shall be sufficient to provide illumination of the raised median.
- C. Objects, such as trees, shrubs, signs, and light poles, shall not physically or visually interfere with vehicle or pedestrian traffic in the travel way.

- D. The style and design of the raised median shall be site specific. The raised median shall be safe for the design speed, and shall be subject to City approval.

### **210.12 Subsurface Drainage**

Subsurface street drainage must be considered in the design of each street. Subsurface drains shall be designed and constructed per the recommendations of the soils report. In the event that no subsurface drainage is required in the soils report, a transverse perforated drain pipe shall be installed below the subbase rock at the low point of each sag vertical curve. The subsurface drains are for the purpose of collecting and conveying subsurface water only, not surface runoff. They are not to be considered part of the storm drainage system for storm drain pipe sizing purposes.

Subsurface drains shall connect and drain into the storm drainage system at catch basins, curb inlets, gutter inlets, manholes, or roadside ditches. Alternative subsurface drainage measures may be used if approved by the City Engineer.

### **210.13 Major Roadway Structures**

- A. Major roadway structures including but not limited to embankments, bridges, retaining walls, headwalls, crash rated traffic barriers, guardrails, handrails, and fencing on bridges and other major structures shall be designed and constructed in conformance with AASHTO and ODOT standards, except that all permanent crash rated roadside traffic barriers shall be designed to meet AASHTO's Test Level 4 (TL-4) criteria, regardless of the street's design speed.
- B. Steeply sloped roadway embankments, steep slopes adjacent to driveways, and retaining walls at those locations shall be provided with crash rated traffic barriers where recommended by the aforementioned AASHTO and ODOT roadway design standards and shall be designed in accordance with subsection 210.13.A.

### **210.14 Transitions**

- A. Street width transitions from a narrower width to a wider width shall be designed with a 3 to 1 taper. Delineators, as approved by the City, shall be installed to define the configuration.
- B. For street width transitions from a wider width to a narrower width, the length of transition taper shall be determined as follows:

$$L = S \times W \text{ (for } S = 45 \text{ MPH or more)}$$
$$L = \frac{W \times (S)^2}{60} \text{ (for } S = \text{less than } 45)$$

Where    L = minimum length of taper (feet)  
          S = design speed (MPH)  
          W = EP to EP offset width

Delineators, as approved by the City Traffic Engineer, may be installed to define the configuration. Maximum spacing of delineators shall be the numerical value of the design speed, in feet (i.e., 35- foot spacing for 35 MPH).

In situations where a tapered transition cannot be provided, a barricade shall be installed at the end of the wider section of the street and a taper shall be appointed and delineated as approved by the City Traffic Engineer. The barricade shall conform to the Standard Drawing. If the wider section does not provide an additional travel lane, only a barricade is required without the transition.

### **210.15 Super Elevation Cross-Sections**

- A. Off-set crown cross-sections are not acceptable as super elevation sections.
- B. Super elevation sections shall be designed using AASHTO guidelines.
- C. Super elevation transitions shall be designed to not allow concentrations of storm water to flow over the travel lanes.

### **210.16 Stub Streets**

Stub streets that are to allow for future extensions shall be barricaded and signed as per the Standard Drawings.

### **210.17 Private Streets, Parking Lots, and Common Driveways**

Streets, parking lots, and common driveways on private property shall meet the requirements of the *Development Code* and this manual. The Engineer shall provide a pavement section designed to support an 80,000-pound truck in all local weather conditions and ground conditions. This design must meet or exceed the following minimum standards:

- A. Areas used for City-required parking or for maneuvering of vehicles shall have a durable hard surface as follows:
  - 1. In all residential areas, a the minimum pavement section shall be 3 inches of asphalt over 2 inches of  $\frac{3}{4}$  inch – 0 inch compacted crushed rock aggregate leveling course over 8 inches of compacted 1  $\frac{1}{2}$  inch – 0 inch crushed rock aggregate base course or shall be 4 inches of portland cement concrete over 2 inches of 1  $\frac{1}{2}$  inch – 0 inch compacted crushed rock aggregate base course over subgrade compacted to 95 percent AASHTO T-99.

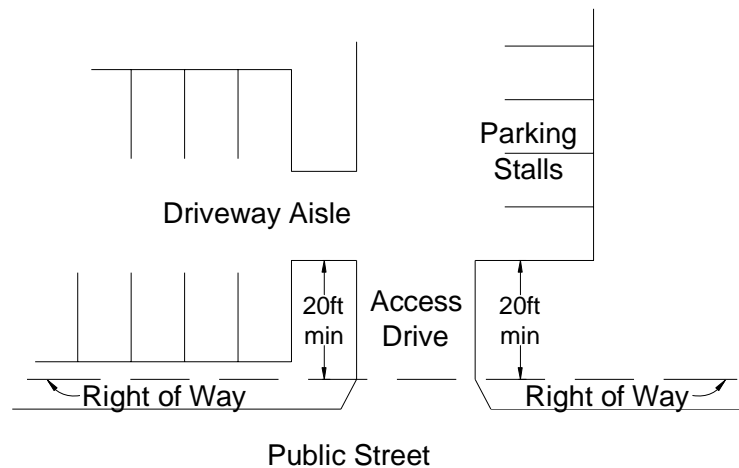
2. In commercial and industrial areas, the minimum pavement section shall be 3 inches of asphalt over 4 inches of compacted 1 ½ inch – 0 inch crushed rock aggregate base course or shall be 5 inches of portland cement concrete over 2 inches of compacted 1 ½ inch – 0 inch crushed rock aggregate base course over subgrade compacted to 95 percent AASHTO T-99.

B. The parking surface shall be placed on a well-compacted subgrade.

C. All required parking spaces shall be striped.

Private streets serving residential areas shall be designed with travel lanes at or above the 25-year flood elevation but not lower than 6 inches below the 100-year flood elevation.

For a driveway or private street serving more than three single-family homes, the required hard surface shall have a minimum unobstructed width of 20 feet. An easement or similar dedication shall be provided to assure maintenance of the required unobstructed width.



Parking access drives shall not be more than 50 feet in width.

On access drives that connect to a public street, there shall be no parking stalls within 20 feet of the right-of-way of the public street.

Access drives shall be located not closer than five (5) feet to a side lot line, except that a common access drive to two adjacent properties (width not exceeding 50 feet) may be provided at the common lot line.

Parking spaces along the outer boundaries of a parking area, except where specifically prohibited, shall be designed to include a continuous curb a minimum of four (4) inches high located not less than six (6) feet from the property line. The purpose of the curb is to prevent

a motor vehicle from extending over an adjacent property line or a street right-of-way. The curb shall be a barrier-type curb per the standard drawing for “Type A Replacement Curb,” except that it may be four (4) to six (6) inches high rather than six (6) inches high as shown in that standard drawing.

The maximum longitudinal grade for private streets and driveways serving two or more single family homes shall be 15.0 percent, with intersection areas no steeper than 5.0 percent.

Access grades shall not exceed 20 percent unless approved by the City Engineer. In instances where grades exceed 20 percent, it must be demonstrated to the City Engineer that the access grade will allow a standard automobile to pass the grade.

## **210.18 Utilities and Other Work in a Public Right-of-Way**

### **A. General**

The installation, maintenance, upgrade, repair, replacement, modification, removal and abandonment of utility facilities (including public and private utility facilities) in public rights-of-way shall be governed by applicable local, regional, state and federal laws, the other chapters of this *Engineering Design Manual* and the Standard Drawings, section 210.18 (hereafter “this section”) and section 210.19 of this *Engineering Design Manual*, and any conditions of approval issued with the City permit(s) for the work, unless a City franchise or applicable state or federal law expressly supersedes or contains an express exemption there from.

### **B. Permits**

1. **Permit Types.** In addition to the requirements of the City’s Site Development Ordinance, if applicable, no person shall engage in certain utility construction, maintenance or repair, including certain private utility work and certain public utility work performed by another unit of government, as more specifically defined hereinafter, that disturbs a public right-of-way, easement, or existing improvements therein without obtaining a Site Development Permit, a Right-of-Way Permit, or a Facilities Permit as prescribed below.

2. **Application and Expiration**

As in section 115, Submittal Requirements, the applicability of each subsection of this section to a Site Development Permit (SD), Right-of-Way Permit (RW), or Facilities Permit (F) is indicated in the left-hand margin beside each paragraph below by a check mark (✓) if the requirement applies and a “Ø” if the requirement does not apply. In addition, the applicability of each subsection to work not requiring a permit (N) is indicated in the same manner.

Applicability:				
SD	RW	F	N	
✓	Ø	Ø	Ø	a. A Site Development Permit required by the Site Development Ordinance for construction involving utility work shall be obtained in the manner prescribed in the Site Development Ordinance and this Manual before beginning any work under said permit. A Site Development Permit for utility installation shall expire one (1) year from issuance, or as otherwise required by the permit conditions, whichever is sooner, in accordance with the Site Development Ordinance.
Ø	✓	Ø	Ø	b. A Right-of-way Permit shall be obtained in the manner prescribed herein for any utility work requiring such a permit and shall expire at the time designated by the City, or one (1) year from issuance, whichever is sooner. A Right-of-Way Permit must be obtained before any work requiring such a permit is begun. In emergency situations as defined herein, the work may begin without a permit; however, the applicant must inform the City Engineer of the nature, location, and expected duration of the emergency work before 12:00 noon of the next business day. Failure to provide the required information may result in suspension of the work until the City receives the required information.
Ø	Ø	✓	Ø	c. A Facilities Permit shall be obtained in the manner prescribed herein for any work requiring such a permit and shall expire at the time designated by the City, or one (1) year from issuance, whichever is sooner. A Facilities Permit must be obtained before any work requiring such a permit is begun.
✓	Ø	Ø	Ø	3. Site Development Permit. a. In addition to the requirements of the Site Development Ordinance that apply to excavations, fills, grading, and floodplain/floodway encroachments, if applicable, no person shall engage in certain major utility construction work in a public street right-of-way that disturbs the right-of-way, alters or tampers with pavement, sidewalks, curbs, gutter, landscaping, utilities or other public improvements, or is not part of the construction of utility facilities in a new subdivision or other development for which a separate Site Development Permit has already been issued, without first obtaining a permit from the City Engineer.
✓	Ø	Ø	Ø	b. A Site Development Permit is required for any of the following:  (1) Utility construction work, excluding utility service lines, that is within one or more collector or arterial streets, an intersection thereof, or a combination thereof, and has a total length of ten (10) feet or more that is within the existing pavement.

Applicability:				
SD	RW	F	N	
				<p>(2) Utility construction work, excluding utility service lines, that is within one or more public streets and has a total length of three hundred (300) feet or more that is in existing pavement, driveways, sidewalks, or other hard-surfaced areas, or any combination thereof.</p> <p>(3) Installation of an aboveground utility facility that is in a public right-of-way, is governed by subsection 210.18.D.3. and is two (2) feet or more in height (above the ground surface).</p> <p>(4) Any utility construction work that requires closure of a traffic lane in an arterial or collector street.</p>
✓	Ø	Ø	Ø	<p>4. Right-of-Way Permit</p> <p>a. In addition to the requirements of the Site Development Ordinance, if applicable, no person shall engage in certain utility maintenance, repair and minor construction work in a public street right-of-way that disturbs the right-of-way, alters or tampers with pavement, sidewalks, curbs, gutter, landscaping, utilities or other public improvements, and is not part of the construction of utility facilities in a new subdivision or other development for which a separate Site Development Permit has already been issued and currently valid, without obtaining a Right-of-way Permit from the City Engineer as provided for herein, unless expressly exempted by subsection 210.18.B.5.</p>
Ø	✓	Ø	Ø	<p>b. A Right-of-way Permit is required for utility construction that is not included in the scope of work of an approved Site Development Permit and consists of one or more of the following types of work:</p> <p>(1) Utility construction work, including but not limited to utility line installation, that is within one or more public streets and the cumulative length of which, within travel lanes, is less ten (10) feet.</p> <p>(2) Utility construction work, including but not limited to utility service line installation, that is within one or more public streets and the cumulative length of which, within existing pavement, driveways, sidewalks and other hard-surfaced areas, or any combination thereof, is less than three hundred (300) feet.</p> <p>(3) Utility construction work, including but not limited to utility service line installation that is within one or more public streets, is entirely outside pavement, driveways, sidewalks, and other hard-surfaced areas.</p>

Applicability:			
SD	RW	F	N
Ø	Ø	✓	Ø

- (4) Installation of an underground utility transmission pipe or conduit, or a utility service pipe or conduit that is twenty (20) feet or more in length, by boring, horizontal directional drilling, tunneling, or similar means.
- (5) Installation of an aboveground utility facility that is less than two (2) feet in height (above the ground surface) in a public right-of-way.
- (6) Utility construction work that is within one or more public streets, is entirely outside existing pavement, driveways, sidewalks, and other hard-surfaced areas, and has a total length of more than one hundred (100) feet and less than five hundred (500) feet, or a total area of more than one hundred (100) square feet and less than one thousand (1,000) square feet.
- (7) All pot-holing and those “keyhole” or other circular street cuts that are one (1) foot in diameter and greater and:
  - a) Are in the improved portion of a public street, or
  - b) Are in a public easement that is occupied by an existing public utility facility, or
  - c) Are in a drainage way, jurisdictional wetland, or a water quality sensitive area.

A Right-of-Way Permit shall expire at the time designated by the City Engineer or one (1) year from issuance, whichever occurs first.

5. Facilities Permit. A Facilities Permit is required for any of the following:
- a. Any work not directly associated with utility and restoration work under an issued Site Development Permit or Right-of-Way Permit.
  - b. Any utility construction work within a public right-of-way or public easement involving a utility service line connection to a City-maintained utility, except work for which no permit is required, as described in subsection 210.18.B.6.
  - c. Sidewalk and driveway repairs and replacements.
  - d. Sidewalk ramp installation.

Applicability:			
SD	RW	F	N
Ø	Ø	Ø	✓
✓	✓	✓	✓
✓	Ø	Ø	Ø
✓	✓	Ø	Ø

e. Planting/removal of street trees.

A Facilities Permit shall expire at the time designated by the City Engineer, or one (1) year from issuance, whichever occurs first.

6. No Permit Required. The following types of utility work do not require a City Site Development Permit, a Right-of-way Permit, or a Facilities Permit but for emergency work require notification of the City by no later than 12:00 noon of the next business day after beginning the work that would otherwise require a permit:

- a. Emergency repairs of existing utility facilities.
- b. Routine maintenance, repair, replacement and other utility work that it within public rights-of-way, does not disturb the right-of-way or existing public improvements, and does not close a pedestrianway, bikeway, or vehicular traffic lane during peak hours (7 a.m. to 9 a.m. and 4 p.m. to 6 p.m.).
- c. Installation of an underground utility service pipe or conduit to a structure, of which ten (10) feet or less of its length is in a public right-of-way, is entirely outside travel lanes of any public street, is performed with minimal disturbance of the public right-of-way and existing improvements, and does not close a pedestrianway, bikeway, or vehicular traffic lane during the aforementioned peak hours.

#### C. Application of Design and Construction Standards

The construction standards in subsection 210.18 and subsection 210.19 apply to public and private utility work throughout the City unless specifically exempted by subsections 210.18.C.1 through 210.18.C.4 immediately below:

1. All new utility facilities that are to be located in a new public right-of-way that is within the boundaries of a new development or redevelopment or within a new public utility easement that is within the boundaries of a new development or redevelopment are exempt from subsection 210.18.D.2 and subsection 210.18.D.3, which only apply to new utility facilities to be located in improved existing public rights-of-way and utility easements.
2. Modifications of existing underground utility facilities that disturb the right-of-way or existing improvements but neither require additional space nor add an at-grade or aboveground component, are exempt from

Applicability:			
SD	RW	F	N
Ø	Ø	Ø	✓
Ø	Ø	✓	✓
✓	✓	✓	✓
✓	✓	✓	✓
✓	✓	Ø	Ø
✓	Ø	Ø	Ø
✓	✓	✓	✓

subsections 210.18.D.1.a, 210.18.D.1.g, 210.18.D.1.h, 210.18.D.2.a, 210.18.D.2.b, 210.18.D.2.e through 210.18.D.2.j, 210.18.E, 210.18.F, 210.18.I, and 210.18.Q.

3. Maintenance and repair (both routine and emergency repair) of existing utility facilities in existing rights-of-way that disturb the right-of-way or existing improvements are exempt from subsections 210.18.D.1.a, 210.18.D.1.g, 210.18.D.1.h, 210.18.D.2.a, 210.18.D.2.b, 210.18.E, 210.18.F, 210.18.H, 210.18.I, 210.18.J, and 210.18.Q.

4. All pot-holing of existing utility facilities and “keyholes” or other circular street cuts performed under a Facilities Permit are exempt from subsections 210.18.G, 210.18.H, 210.18.I, and 210.18.Q.

#### D. Location and Design of New Utility Facilities

##### 1. General

a. All new underground utility facilities to be installed in street rights-of way and public easements shall be installed in conformance with applicable local, regional, state and federal law and in the standard locations within the right-of-way or easement required by this manual.

b. Except as otherwise required by this Manual or by the City Engineer, new private utility facilities shall be located outside of the paved area of the street to the extent commercially reasonable and practicable so as to avoid future street cuts, except that public utility service lines may be extended across the paved area of the street.

c. On all phased or interim street improvements, public utility facilities shall be stubbed across the interim improvement to ensure that cuts are not necessary when the road is expanded to its full width.

d. All private utility lines (linear facilities) shall be placed underground, except as expressly allowed otherwise by the City’s *Development Code*, as amended from time to time, or by applicable state or federal law. (See *Development Code* subsection 60.65.15.1 for current exceptions.)

e. The City does not allow, without the prior express approvals of the City Engineer and the Operations Director, potholing (exploratory excavations), “keyhole” cuts or other circular street cuts that are one (1)

Applicability:			
SD	RW	F	N
✓	✓	✓	Ø
✓	✓	✓	✓

foot in diameter or greater, or installation of an underground utility facility requiring a street cut in a paved or resurfaced arterial or collector street that has been paved or resurfaced within the previous five (5) years or other streets that have been paved or resurfaced within the previous three (3) years (sometimes referred to as “moratorium streets.”) See subsection 210.19.A. for clarification of this policy.

- f. New private underground utility facilities intended to provide direct service to adjacent properties with future connections shall not be located in the full-width paved section of a street to be constructed. If all service connections are existing and extend beyond the full-width section of a partially improved (or interim) street, underground utility facilities can be located in the future paved section of the street, if approved by the City Engineer.
- g. All new underground utility facilities shall be installed with the following minimum depths (i.e., depths of cover, from the proposed finished grade down to the top of the new facility), horizontal separations and vertical separations except when greater minimum depths are required by the National Electric Safety Code:

Applicability:				Minimum Standard Depths and Separations of New Underground Utility Facilities in Public Rights-of-Way			
SD	RW	F	N	Type of Utility Facility	Minimum Depth Required	Minimum Horizontal Separations Required	Minimum Vertical Separations Required
✓	✓	✓	✓	Public	Thirty (30) inches	(a) Minimum horizontal separation from other public utility facilities: As specified in Chapters III, IV, V and VI of this Design Manual (b) Minimum horizontal separation from parallel private utility facilities: Three (3) feet	(a) Minimum vertical separation from other public utility facilities: As specified in Chapters III, IV, V and VI of this Design Manual (b) Minimum vertical separation from private utility facilities: One (1) foot
✓	✓	✓	✓	Private	At least equal to the standard depths adopted by the respective	(a) Minimum horizontal separation from public utility facilities: Three (3) feet (b) Minimum horizontal separation from other parallel private utility	(a) Minimum vertical separation from public utility facilities: One (1) foot (b) Minimum vertical separation from other private utility facilities: At least equal to the minimum standard separations

<b>Applicability:</b>				<b>Minimum Standard Depths and Separations of New Underground Utility Facilities in Public Rights-of-Way</b>			
<b>SD</b>	<b>RW</b>	<b>F</b>	<b>N</b>	<b>Type of Utility Facility</b>	<b>Minimum Depth Required</b>	<b>Minimum Horizontal Separations Required</b>	<b>Minimum Vertical Separations Required</b>
					utilities consistent with current local, state and federal law <sup>1</sup>	facilities: At least equal to the minimum standard separations adopted by the respective industries consistent with current local, state and federal law.	adopted by the respective industries consistent with current local, state and federal law
✓	✓	✓	✓	<sup>1</sup> The private utilities' standard depths (of cover) in this area are as follows: [a] Natural gas lines: Mains at 24-inches to 48-inches; services at 18-inches to 30-inches. [b] Power lines: 30-inches (primary and secondary lines), except in joint use trenches with other electric utility lines, primary power lines will be below the other electric utility lines and will have a minimum of 12-inch vertical separation from the other lines. [c] Cable TV lines: Main lines at 30-inches; services at 12-inches. [d] Copper telephone lines: Main lines at 30-inches; services at 18-inches. [e] Other copper telecommunications lines: 30-inches; services at 18-inches. [f] Fiber optic telecommunications lines: 48-inches to 60-inches.			
<b>Applicability:</b>				h. Methods of installation that do not cut the pavement or undermine the aggregate base of the street (i.e., "trenchless" methods), such as boring or driving, shall be used as required and as approved by the City Engineer.  For lines six (6) inches in diameter and larger, and for all lines that will cross existing lines, the City Engineer may require that an in-situ subsoil investigation be performed by a qualified professional civil or geotechnical engineer retained by the permittee to properly determine the subsoil conditions and to recommend the most desirable method that will not disrupt the surface grade or integrity of existing utilities in the right-of-way. As alternatives, the City Engineer may accept copies of previous in-situ subsoil investigations in lieu of a new subsoil investigation, or may waive the requirement for an in-situ subsoil investigation if documentation is available that other underground construction in the immediate vicinity encountered acceptable subsurface conditions and the documentation is acceptable to the City Engineer. The permittee shall submit a written report on the findings of the subsoil investigation to the City. The City may require other information on the method proposed or on the contractor's qualifications in order to make final approval. Any and all surface heave or			
<b>SD</b>	<b>RW</b>	<b>F</b>	<b>N</b>				
✓	✓	✓	✓				

Applicability:				
SD	RW	F	N	
				settlement, or related problems caused by the trenchless method shall be corrected by the permittee at its expense, to the satisfaction of the City. The trenchless methods of concern include but are not limited to pushing conduit or reaming and backpulling conduit through pilot bore holes of any size. Any annular region or other cavity remaining after the installation of the conduit, pipe or cable shall be pressure grouted to the satisfaction of the City, prior to backfilling the bore pits. All drilling fluids shall be removed and disposed of properly. All entrance and bore pits and other affected areas shall be cleaned of all objectionable material and properly backfilled and restored. All such areas shall be restored to original contour, shape, appearance and condition.
✓	✓	✓	✓	i. In difficult underground conditions such as an area of a public right-of-way containing numerous existing utility facilities, the City Engineer may require increased depths and separations for safety, maintenance, or repair purposes.
✓	✓	✓	✓	j. Underground vaults and other structures, and their access doors, manholes or other access facilities to be constructed within ten (10) feet of a vehicular travel way shall be designed for vehicular traffic loading on paved surfaces. All access doors, manholes, and other access facilities shall be designed and reinforced to a manufacturer's standard suitable at a minimum for AASHTO HS 20 traffic loadings on off-street locations that are not subjected to high-speed or high-density traffic. The utility will be responsible for repairing such utility structures and their access facilities that are damaged by any commercially available public vehicles, including but not limited to emergency vehicles, with a weight of 80,000 pounds or less.
✓	✓	✓	✓	k. Utility access facilities that encroach into the sidewalk shall conform to ADA requirements.
✓	✓	✓	✓	l. At-grade and aboveground utility facilities, including but not limited to transformers, enclosures, cabinets, housings, pedestals, and other utility facilities, shall bear the owner's name and identification or reference number for that facility, but shall not bear any signs or advertising devices (other than certification, warning, or other required seals or signage). If the City notifies the utility in writing that this information is missing or illegible, the utility shall replace it within 30 calendar days. Emergency repairs and replacements for existing utility facilities are exempt from the requirements of this paragraph for a period of ninety (90) days after they are installed.
✓	Ø	Ø	Ø	m. A development or project with two hundred (200) feet or more of frontage on an arterial or collector street within or abutting the development shall provide for future signal interconnects in the public rights-of-way. That is, in each collector

Applicability:			
SD	RW	F	N
✓	✓	Ø	Ø
✓	✓	✓	✓
✓	✓	✓	✓
✓	✓	✓	✓
✓	✓	✓	✓

and arterial street within or abutting the development or project, the development or project shall furnish and install along its entire frontage on collector and arterial streets a two (2) inch diameter, Schedule 40 or 80 PVC or rigid metal conduit conforming to the requirements of this Manual for street illumination along its entire frontage.

- n. When new curbing is being placed, a stamp or tag shall be placed to mark where each water and sanitary sewer service crosses the curb line. The method of marking the curb shall be approved by the City Engineer and noted on the approved construction plans. If an imprinting stamp is used, the impression left for a water service shall be the letter "W"; for a sanitary sewer service, it shall be the letter "S". These impressions shall be two (2) inches high, placed on the top of the curb.

2. Underground Utility Facilities to be Installed in Existing Improved Public Rights-of-way

In addition to the requirements of subsection 210.18.D.1, all proposed underground utility facilities to be installed in existing improved rights-of-way shall be installed as follows:

- a. They shall be installed in the standard locations within the right-of-way or easement specified herein and elsewhere in the *Engineering Design Manual and Standard Drawings*, unless the City Engineer finds that existing conditions prohibit installation in the standard locations and approves alternate locations.
- b. They shall be installed as near to adjacent existing underground private utility facilities as is commercially reasonable, practicable, and consistent with other requirements herein, but shall be located so as not to interfere with the safety, operation, inspection, maintenance, repair, replacement, or extension of public utility facilities.
- c. They shall not be located under existing pavement unless permitted by the exceptions below or expressly permitted by the City Engineer:
  - (1) Private underground utility facilities may be constructed in the pavement of an existing street if they are installed by a method that does not cut the pavement or undermine the aggregate base of the street, such as boring, driving, or another acceptable method.

Applicability:			
SD	RW	F	N
✓	✓	✓	✓
✓	✓	✓	✓
✓	✓	✓	Ø
✓	✓	✓	✓
✓	✓	✓	✓

(2) Existing private underground utility facilities that are already in the pavement of an existing street may be replaced, upgraded, or expanded in the same location, or extended along a projection of their existing alignment unless the facilities would create a safety hazard, would damage another utility facility, or would impair the operation, inspection, maintenance, repair, or extension of public utility facilities in that location. However, if an existing underground utility facility is extended along a projection of its existing alignment in the street pavement, it shall be returned to the City's standard location and alignment outside the pavement at the earliest opportunity to do so that is commercially reasonable and practicable.

- d. They shall be installed in a manner that avoids conflicts with existing public utility facilities. The new utility facilities shall be installed at the depths, horizontal separations and vertical separations specified for utilities in unimproved rights-of-way and easements above, except as may be required otherwise by the City Engineer to prevent conflicts with the operation, inspection, maintenance, repair, and replacement of any existing public utility facilities and any future extensions of said public utility facilities or services that can reasonably be expected by the City to be installed in the future.
- e. If an underground utility facility must cross an existing paved street that is not a residential street serving predominantly single family residences, the underground facility shall be installed by a method that does not cut the pavement or undermine the aggregate base of the street unless expressly approved by the City Engineer.
- f. A replacement for an existing underground utility facility proposed to be in approximately the same location and at the same depth as the existing facility it is to replace is exempt from these depth requirements and may be installed at the same depth as the existing facility it is replacing, providing the existing depth complies with applicable electrical codes, state and federal laws, and installing the replacement facility at the same depth will not create a safety hazard or impair the operation, inspection, maintenance, repair, or replacement of any existing public utility facilities and any future extensions of said public utility facilities or services that can reasonably be expected by the City to be installed in the future.
- g. With the exception of emergency repairs, no construction of underground utility facilities in an existing right-of-way may begin until all existing utility facilities (including but not limited to all public and private utility main lines and service lines) have been located in the field and marked. Under OAR

Applicability:			
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✓	✓	Ø	✓
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✓	✓	✓	✓

952-001-0090, a permittee may not excavate for any work other than emergency repairs until the existing utility facilities have been affirmatively located and marked in the field.) Prior to constructing a utility facility in an improved existing right-of-way, the permittee shall locate all known existing facilities in the public rights-of-way based on the best information available, show the existing utilities on the construction plans in the plan and profile views as clearly and accurately as possible (based on available records), and have the existing facilities marked in the field by the appropriate agency. Planning of the proposed utility facilities shall be done jointly with the City Engineer in order to determine the most feasible route and depth. The City Engineer may require additional vertical and horizontal clearance to protect existing utility facilities from damage or for safety or maintenance reasons

- h. A proposed private manhole cluster (i.e., a group of two or more proposed manholes serving the same type of utility that are generally spaced less than fifty (50) feet apart) shall not be located within 300 feet of a signalized intersection, including future intersections planned by the City.
  - i. If a new utility facility must be located within the paved area of the street, to the extent commercially reasonable and practicable, the facility shall be located so that the edge of the pavement cut is not within an existing pavement patch or a wheel path. If, due to site conditions, the edge of a street cut must be in a wheel path, the City Engineer may require removal of additional pavement.
  - j. To the extent commercially reasonable and practicable, new underground utility vaults, manholes, and other structures with at-grade access doors, manhole covers, or other access facilities that encroach into the sidewalk shall be located on the projection of a common property line between two parcels or as far apart as possible.
  - k. After pot-holing (exploratory excavation) or other window cut excavating has been performed in an arterial or collector street that has been paved or resurfaced within the previous five (5) years, or other street that has been paved or resurfaced within the previous three (3) years, pavement restoration shall be performed in accordance with section 210.19.
3. At-grade and Aboveground Facilities to be Installed in Existing Improved Public Rights-of-way.

At the option of the applicant and subject to rules promulgated by the Oregon Public Utility Commission (PUC), the requirements of this subsection

<b>Applicability:</b>			
<b>SD</b>	<b>RW</b>	<b>F</b>	<b>N</b>
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✓	✓	✓	Ø
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✓	✓	Ø	Ø
✓	✓	Ø	Ø

210.18.D.3. apply to surface mounted transformers, surface mounted connection boxes, telephone pedestals, power supplies, surge suppressors, tap/splitters and other similar facilities to be installed by an electric power, telephone, cable television or telecommunications utility company in an existing public right-of-way.

The requirements of this subsection 210.18.D.3. do not apply to the following existing or proposed aboveground utility facilities: utility poles, overhead utility lines, guy wires, street light poles and luminaires, traffic signal poles, signal heads and span wires, and their attached overhead appurtenances, meter cabinets, temporary utility service facilities during construction, or high capacity electric lines operating at 50,000 volts or above.

All proposed at-grade and aboveground utility facilities to be constructed, relocated, or upgraded within a public right-of-way including but not limited to those required for electric power, telephone, cable television, and telecommunications, shall be located and constructed as follows:

- a. They shall conform to the provisions of this manual except as expressly provided otherwise herein, as amended from time to time, or by applicable local, State, or federal law.
- b. To the extent commercially reasonable and practicable, they shall be installed in such a manner as to minimize the disturbance of their surroundings, natural and man-made, to the extent consistent with City franchises and applicable local, state, and federal law. In determining the extent of said disturbance for purposes of permitting, the City shall consider public health, safety and welfare, private property rights, and impacts on property amenities and values to be paramount.
- c. To the extent commercially reasonable and practicable, they shall be located within ten (10) feet of a lot corner.
- d. To the extent commercially reasonable and practicable, proposed aboveground utility facilities governed by this Design Manual that are commercially available in equivalent underground models acceptable to the utility shall be installed underground unless placing said equipment underground would create a safety hazard or impair the maintenance or repair of public utility facilities. Electric and gas meter sets, gas regulator stations, cathodic protection test stations, power transformers are exempt from this requirement.

Applicability:			
SD	RW	F	N
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✓	✓	Ø	Ø
✓	✓	Ø	Ø

When underground installation of a proposed new utility facility in an existing public right-of-way is not allowed or is not commercially reasonable or practicable, the applicant shall consider alternative aboveground facilities and their locations in the order of preference prescribed by subsection 210.18.D.11.f. to the extent commercially reasonable, practicable, and consistent with applicable local, regional, state, and federal law. Facility replacements installed in the same location as the facilities they are replacing are exempt from this requirement unless said replacement would perpetuate or create a safety hazard or impair the maintenance or repair of an existing public utility facility. Enclosures to be installed underground shall be manufactured specifically for underground service.

If an applicant believes that it is not commercially reasonable and practicable to install such equipment underground and desires an exemption on that basis, the applicant shall submit to the City Engineer in a form conforming to section 145 Design Modifications and acceptable to the City Engineer, a written explanation regarding the hardship associated with, or unfeasibility of, underground installation. The City Engineer shall review the explanation, shall consult with qualified utility industry representatives and decide whether the underground installation is commercially reasonable and practicable, and shall inform the applicant of his/her decision within fourteen (14) calendar days. An applicant seeking an exemption from this requirement for all future installations of its equipment shall submit to the City Engineer (1) a letter requesting exemption and (2) a comprehensive manual for its facilities, including descriptive literature and engineering data for all proposed equipment, cabinets, node housings, pedestals, and other enclosures. The letter and manual combined shall contain sufficient information for the City Engineer to determine whether underground installation is commercially reasonable and practicable. Any class of utility facilities for which the City Engineer determines underground installation to be not commercially reasonable and practicable shall be granted an exemption, subject to the City Engineer's revocation of his/her determination for reasonable cause at any time.

- e. The location of proposed aboveground utility facilities shall be in accordance with the following order of preference to the extent commercially reasonable, practicable, and consistent with applicable state or federal law, and the standards and operating requirements of those power, gas, telephone, cable TV, and telecommunications companies operating within Beaverton on the effective date of the *Engineering Design Manual and Standard Drawings*.

Applicability:			
SD	RW	F	N
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✓	✓	✓	Ø

- (1) Adjacent to non-residential properties in an area where no modification to the existing right-of-way would be required and existing landscaping is present to screen the facilities from view.
  - (2) Adjacent to side or rear yards of residential properties, preferably on major streets where no modification to the existing right-of-way would be required and existing landscaping is present to screen the facilities from view.
  - (3) As close as possible to the common property line between the front yards of residential properties where no sight distance from driveways would be obstructed.
  - (4) At corner residential lots, aboveground facilities shall not be located at the lot corner nearest the intersection, except with the City's prior approval, and then only if the aboveground unit(s) will not obstruct the sight triangle at the intersection.
- f. To the extent commercially reasonable and practicable, proposed new, relocated, and upgraded at-grade and aboveground private utility facilities of any kind shall be located so as to minimize impairments to the relocation, extension, upgrading, operation, and maintenance of existing public street and utility improvements, adjacent private property and improvements thereto, including driveways, landscaping, trees, shrubs, plants, groundcover, lawn, surfacing and other improvements.
- g. Proposed new, relocated, and upgraded at-grade and aboveground utility facilities shall not:
- (1) Obstruct the line of sight requirements at intersections or driveways.
  - (2) Obstruct or hinder the opening of a door or a vehicle parked at curbside, in a designated parking space, or adjacent to a residential driveway.
  - (3) Obstruct disabled access along public sidewalks to the extent that a minimum clear passage width of four (4) feet would not be maintained.
  - (4) Interfere with any existing or proposed infrastructure improvement projects.

Applicability:			
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✓	✓	✓	✓
✓	✓	✓	✓

- h. To the extent commercially reasonable and practicable, an applicant proposing the installation, relocation, or upgrade of an aboveground utility facility that is two (2) feet or more in height as measured above the surface of the nearest curb, sidewalk, or driveway, shall locate said facility at a common lot corner between adjacent lots and should locate said facility as far as possible from other existing aboveground utility facilities that are two (2) feet or more in height. In addition, aboveground utility facilities located in the planter strip should be located at the same distance from the curb as other utility facilities along the planter strip to create a uniform setback distance and appearance.
- i. A new at-grade or aboveground utility facility shall not be located in an existing public right-of-way in such a way as to require the removal of an existing tree. Any removal or pruning of a tree is subject to the provisions of sections 40.90 and 60.60 of the *Development Code*.
- j. To the extent commercially reasonable and practicable, a utility proposing to install a new, relocated, or replacement facility shall consider minimizing the number of aboveground utility facilities that would be clustered together and shall consider minimizing over-concentration of at-grade and aboveground utility facilities (including existing and proposed facilities). For purposes of this section, over-concentration is defined as three (3) or more aboveground utility facilities, each of which has an aboveground volume of one and one-half (1-1/2) cubic feet or more that are less than ten (10) feet apart.
- k. The height of a proposed new aboveground cabinet, housing, pedestal, or other aboveground facility, including any facility replacing an existing facility, that is taller than the applicant's existing units in the immediate area and is to be located in a public right-of-way adjacent to the front, side, or rear property line of a residentially zoned property, may not exceed the permitted height of fencing as determined at the property line.
- l. New at-grade and aboveground utility facilities, including but not limited to transformers, enclosures, cabinets, housings, pedestals, power supplies, surge suppressors, tap/splitters and other utility facilities, shall be constructed of durable, new, or like-new materials, shall be green, tan, or brown colored.
- m. To the extent commercially reasonable and practicable, all at-grade and aboveground utility facilities are subject to current City ordinance(s) relating to removal of graffiti.

Applicability:			
SD	RW	F	N
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n. A proposed aboveground utility facility shall not be located immediately in front of a building, structure, or public stairway such that it causes a violation of ADA guidelines for pedestrian passage and shall not obstruct pedestrian passage from private property to the public right-of-way.			
✓	✓	✓	Ø
o. Private utility services stubbed to the right-of-way line or to a public utility easement and terminated there may be terminated with a riser extended up to the ground surface, provided the top of the riser is cut off and capped flush with the ground surface.			
✓	✓	✓	Ø
p. Prior to constructing an at-grade or aboveground utility facility, a public or private utility shall meet or confer with all persons entitled to notice under subsection 210.18.H. of this manual and shall make reasonable accommodation of those persons' needs relating to their work schedule, noise, and other emissions, access to those persons' property, and the appearance of that property during and after the utility's construction.			
✓	✓	Ø	Ø
q. All new aboveground utility facilities in existing improved public rights-of-way shall be screened from view. To the maximum extent commercially reasonable, practicable, and consistent with the utility's standards and operational requirements, new at-grade and aboveground utility facilities, including new facilities replacing existing facilities, that are three (3) feet or more in height, shall be screened from view through the use of fencing, walls, landscaping, or other means that match the type and color of surrounding features including but not limited to existing fencing, buildings, other structures, and landscaping, and shall comply with the <i>Development Code</i> .			
E. Coordination of Trench, Conduit and Enclosure Construction and Joint Occupancy in an Existing Public Rights-of-way			
✓	✓	Ø	Ø
1. When the City or another entity notifies a permittee that two or more utilities are planning to work in the same existing right-of-way, the permittee and the other utilities shall coordinate their work to the extent commercially reasonable and practicable to reduce space requirements, conflicts and the impacts of utility construction activities on the right-of-way and adjacent private property. Underground utility cables and conductors serving the same or different types of utilities shall occupy the same trench where commercially reasonable and practicable. When the City requests utilities to coordinate their proposed work, their failure to do so in accordance with this subsection will be grounds for the City to suspend their permit(s) for the work until they perform such coordination satisfactorily.			

Applicability:			
SD	RW	F	N
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✓	✓	✓	✓
✓	✓	✓	✓
✓	✓	✓	✓

2. In furtherance of the public purpose of reduction of rights-of-way excavation, it is the goal of the City to encourage both the shared occupancy of underground electrical and telecommunications trenches, bored conduits, and casings.
  - a. City Use. In the course of the City's review of plans of a private utility for work that disturbs an existing public right-of-way or public improvements, the City may request installation of facilities at the City's cost for the City's use.
  - b. Use of City Utility Facilities. If the City has constructed underground utility facilities and those facilities have excess capacity, the City may require private utility companies proposing to construct new facilities along approximately the same route to consider use of the City's excess capacity on mutually agreed terms.
3. Joint Trenching. To the extent commercially reasonable and practicable, multiple private utility facilities to be constructed in the same existing public right-of-way shall be located in a joint trench as illustrated in the *Standards Manual* of the Oregon Utilities Coordinating Council.

#### F. Utility Facilities Operation and Maintenance

Utility facilities shall be operated and maintained as follows:

1. Except for lawful releases from natural gas facilities, utility facilities shall not emanate noise that exceeds the City's noise standards nor discharge hazardous or toxic liquids or gases to the surrounding environment.
2. The utility shall maintain all facility screens to be in conformance with ADA requirements and other applicable law.
3. To the extent commercially reasonable and practicable, all at-grade and aboveground utility facilities are subject to current City ordinance(s) relating to removal of graffiti.
4. The owners of at-grade enclosures and aboveground cabinets, housings, pedestals, and other aboveground facilities shall keep their facilities in good condition structurally, mechanically, electrically, and aesthetically free of dents, scratches, gouges, rust, peeling paint, loose parts, and in a level, upright (plumb) position.

Applicability:			
SD	RW	F	N
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✓	✓	Ø	Ø
✓	✓	Ø	Ø

#### G. Notification of Adjacent Property Owners and Tenants

Prior to beginning construction under a Site Development Permit or a Right-of-way Permit the utility shall give the City Engineer and the occupants of building(s) within fifty (50) feet of project construction activity adequate written notice by mail or by a "door hanger" notice. Said notification may be addressed to "occupant" and shall be given no less than five (5) days before the work is to begin. Said notification shall clearly identify the location and type of work to be performed, the anticipated date and time that the work is to be performed, and the name and telephone number(s) of the utility company's representative(s) that a property owner should call to contact the utility. In addition, if the proposed construction will extend five hundred (500) feet or more in length or the expected duration of the construction is one (1) month or longer, the utility shall also notify the Neighborhood Association Committee (NAC) contact for the area at the NAC contact's address currently on file at the City.

#### H. Consultation with Adjacent Property Owners

A private utility shall meet or confer with any person entitled to notice under subsection "G" above and shall make reasonable accommodation, as determined by the City Engineer, of that person's needs relating to the work schedule, access to that person's property, and the appearance of that property during and after the utility's construction.

#### I. Project Sign

1. Except as otherwise noted herein, private utility work done under a Site Development Permit or a Right-of-way Permit that is not associated with a city, county, or state project and disturbs the right-of-way or public facilities for a distance of 500 feet or more, or over a project duration of 30 calendar days or more, shall, at least 24 hours before beginning work, be posted for the benefit of pedestrian and vehicular traffic with a post-mounted sign at each end stating the following information:
  - a. The type of work being done,
  - b. The name of the utility company,
  - c. The name of the contractor,
  - d. The name and telephone number of the utility company's responsible project contact person.

Applicability:			
SD	RW	F	N
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✓	✓	✓	Ø

2. The sign shall be legible with lettering no smaller than 4 inches in height.
3. The project sign shall be maintained in good condition at all times.

#### J. Construction Operations

1. Construction facilities, equipment, tools and materials shall be stored at the construction site as inconspicuously as possible and for the shortest period of time possible. If construction operations are suspended due to inclement weather conditions or for other reasons, the permittee shall monitor its construction facilities, equipment, tools and materials at the work site frequently and ensure that they remain stored in a safe, orderly and inconspicuous manner. The permittee shall monitor temporary traffic control at the construction site daily and shall maintain a safe flow of traffic with minimum interruptions and inconvenience to motorists, bicyclists and pedestrians.
2. To minimize the impacts of private utility construction, the total area of public right-of-way disturbed during construction of private utility facilities that are governed by these standards shall be kept to a minimum. In addition to the requirements of section 150.5 and 150.6, the following requirements apply:
  - a. In the excavation of pot-holes, low impact, non-invasive excavation methods such as "VacX", "SafeX", "Air-spade" or other similar methods shall be used to the maximum extent commercially reasonable and practicable.
  - b. In the excavation of open trenches, bore pits and other excavations, the length of open trench shall be kept to a minimum, and the number of unrestored bore holes and other excavations during construction shall be kept to a minimum. The City Engineer shall be the sole judge of the extent of construction disturbance allowed, the amount of open trench allowed, and the number of unrestored bore hole and excavation sites allowed based on vehicular traffic, pedestrian traffic and other work conditions of the area. In normal cases, the maximum allowed total length of open trench shall not exceed 200 feet; the maximum allowed total length of pavement cut that has not been restored temporarily (i.e., steel plated or temporarily patched with cold-mix asphalt concrete) shall not exceed 400 feet; and the maximum allowed number of bore hole and excavation sites that have not been restored permanently shall not exceed

Applicability:			
SD	RW	F	N
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✓	✓	✓	✓
✓	✓	✓	✓

four (4) concurrently. In addition, the maximum allowed total length of trench pavement cut that has not been restored permanently (i.e., patched with hot-mix asphalt concrete or portland cement concrete (PCC) pavement, as required by the permit) shall not exceed 1000 feet.

#### K. Cleanup and Restoration

1. This section applies to all private utility work in a public right-of-way and to a public utility easement that is already occupied by a public utility facility, whether or not a City permit is required, and supplements the requirements of section 150.6 of the City's *Engineering Design Manual*. "Cleanup and restoration," as used herein, includes all labor, equipment and materials needed to maintain the work area in an acceptable condition during construction and to restore the work area to its condition prior to start of construction, or better condition as required to meet current construction standards, promptly upon completion of the work. Any utility replacing an existing line or facility or installing a new or upgraded line or facility in an improved public right-of-way or easement shall perform the cleanup of their work area as an ongoing process that is performed on at least a daily basis. Materials and equipment shall be confined to as small an area as possible and maintained in an orderly fashion. Excavated material, backfill and other materials and equipment stockpiled at the work site shall be confined so as not to spill outside of the immediate area of work. Temporary traffic control devices shall be monitored daily and maintained in their proper location and position. Materials and equipment removed from the immediate work site by vandals or others without permission and left nearby shall be returned promptly to the work site by the utility. Garbage and debris from lunches or breaks shall be removed from the work area immediately. Packing cases and wrapping material for materials delivered to the work area shall be removed as soon as they are emptied or unwrapped. Unused or unneeded construction materials, including conduit ends, cable ends and other remnants that are not be used shall be removed from the work area promptly. Sod, shrub and tree trimmings, whole shrubs, trees and other vegetation that are irreparably damaged by the work shall be removed from the work area promptly. The City Engineer may require a work site to be temporarily fenced with construction fencing if, in his/her judgment, the site has been unsightly, unmaintained or unconfined for an excessive period of time, is a nuisance or is hazardous.
2. The utility is responsible for erosion control in accordance with OAR 340-41-455 and must remove all debris such as excess excavated soil, tree limbs and chunks of concrete except any debris that the adjacent property owner

Applicability:			
SD	RW	F	N
✓	✓	✓	✓
✓	✓	✓	✓

and the utility agree is to be left on his/her property. The utility shall obtain written permission from a property owner who allows the utility to leave debris on the property owner's property and shall provide a copy of same to the City on request.

3. Damaged sidewalk shall be repaired promptly to its pre-existing condition or better, in conformance with current ADA standards to the extent commercially reasonable, and in a workmanlike manner, but this section does not require the utility to construct additional, new sidewalk. All sidewalk panels, sidewalk wheelchair ramps, and driveway aprons damaged by utility construction shall be removed completely and the damaged panels replaced, unless otherwise approved by the City Engineer. In the replacement of individual sidewalk panels, the City Engineer may allow the replacement panels to match the width of the original panels where they join the remaining existing sidewalk, even though the original panels did not comply with ADA standards, except that individual panels in wheelchair ramps shall be replaced with new panels that comply in all respects with ADA standards, except the utility will not be required to remove signs, utility poles or other obstructions that were in the existing sidewalk or wheelchair ramp. To the extent commercially reasonable and practicable, the utility shall make accommodations for the City to remove existing obstructions and upgrade adjacent existing sidewalks that are not ADA-compliant, all of which shall be done at the City's cost.
4. The concrete mixture used in sidewalk repairs shall be a 4,000-psi mixture at 28 days. At least 24 hours prior to pouring concrete, the permittee shall request that the City Engineering Inspector inspect the forms, subgrade, thickness and other construction details. Prior to removing any sidewalk, the permittee shall place signs announcing that the sidewalk is closed. Such signs shall be placed at all intersections leading to the sidewalk where work is being performed. All sidewalks removed for construction along collector and arterial streets shall be plated (or patched with a hard durable material such as compacted 3/4" - 0 crushed rock, asphaltic concrete or equivalent material approved by the City) at the end of each workday. All sidewalks removed for construction along residential streets shall have lighted barricades installed at each end of the removed section at the end of each work day or patched with a hard durable material such as compacted 3/4" - 0 crushed rock, asphaltic concrete or equivalent material. No sidewalk may be left in an impassable condition for a period exceeding five (5) workdays without the prior approval of the City Engineer. All sidewalk wheelchair ramps that are disturbed ("disturbed" being defined here as any physical damage or alteration which causes the existing ramp to become either non-

Applicability:			
SD	RW	F	N
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✓	✓	✓	✓
✓	✓	✓	✓

functional or in need of repair of over 10 percent of the ramp) shall be reconstructed to current City standards. Existing sidewalks shall be kept free of obstructions except in those cases where, in the City Engineer's judgment, the sidewalk must be obstructed or removed for construction purposes. If a sidewalk must be obstructed or removed, the sidewalk shall be restored as described above or an alternate walkway shall be provided within 4 hours.

5. If a permittee cuts, damages or otherwise disturbs a paved or hard-surfaced existing street or sidewalk, said permittee shall do so only if specifically permitted by the City Engineer and shall repair the damage and restore the surface to its original condition, or better condition as required to meet current construction standards, satisfactory to the City and as specified in this section and section 210.19 of the *Engineering Design Manual and Standard Drawings*.
6. If a permittee disturbs a landscaped area, planted area, established grassed or lawn area or surfaced area (with gravel, bark dust, wood chips or other material), the permittee shall repair the damage and restore the area to its original condition in conformance with section 150.6, or better condition as required to meet current construction standards, and shall maintain the restored area until any new plants are established. The permittee shall replace all damaged established grassed and lawn areas with healthy sod and shall replace other grassed areas with hydro-seeded grass.
7. A person who disturbs a public right-of-way shall schedule the work to ensure that the period of time the work site is disturbed (during mobilization, construction, restoration and cleanup) is kept to a minimum. Disturbed areas of the right-of-way and, where applicable, public utility easements shall be restored reasonably promptly. Permit applicants are cautioned that the expiration time specified in the Site Development Permit is not necessarily the minimum time in which the portion of the work that is within existing public right(s)-of-way and, where applicable, public utility easement(s), is to be completed, and that the City expects the permittee to complete that work earlier than other work, if possible. Notwithstanding the repair of sidewalks as specified above, in no case may any disturbed area of the right-of-way or applicable public utility easements go un-restored for more than 30 calendar days, nor may any area of a public utility easement, where applicable, go unrestored for more than seven (7) calendar days, unless the permittee obtains written permission from the City for a longer period of time when justified by inclement weather, unusual delays in the delivery of materials, or other conditions not under the permittee's control. If a permittee is delinquent in cleaning up or restoring a disturbed area, allowing for such extensions of

Applicability:			
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✓	✓	✓	✓

time as may be granted by the City, and the City notifies said permittee of the delinquency, said permittee shall complete the restoration within 14 calendar days of receiving notice from the City. If the permittee fails to restore the right-of-way or public utility easement, the City shall cause such restoration to be made at the permittee's expense. The City Engineer may grant the permittee an extension of time for completion of permanent restoration if there are extenuating circumstances that justify the extension, if the permittee requests an extension of time in writing and the permittee agrees to implement such temporary restoration measures as may be required by the City Engineer, including temporary walkway surfacing, paving or other improvements.

#### L. Damaged and Disassembled Utility Facilities

Utilities shall take reasonable care to ensure that damaged, disassembled or partially disassembled cabinets, node housings, pedestals and other aboveground utility facilities that pose a safety hazard, have been substantially damaged or disassembled or are unsightly are restored satisfactorily by the utility reasonably promptly. If the City or another entity notifies the owner of a facility that said facility has been damaged materially, and repair or replacement of the facility is commercially reasonable and practicable, the owner shall restore, repair or replace the damaged facility to satisfactory condition within thirty (30) calendar days from the date the owner was notified, providing the repair is commercially reasonable. This requirement applies to all such facilities, whether disassembled for a utility construction project or damaged by accident or vandalism. The owner and the City shall determine jointly whether the damage is material and repair is practicable.

#### M. Relocation of Utility Facilities

1. Upon the City's determination that an existing utility facility in a public right-of-way must be relocated (to the extent consistent with current franchise agreements) to allow construction or maintenance of public improvements or that it must be modified when the public interest requires, the City shall give said facility's owner 90-days notice before the facility must be relocated. Upon discovery that a utility facility in a public right-of-way appears to be abandoned and the City determines that said facility shall be abandoned formally or relocated, the City shall give the facility's owner (at the owner's address on file at the City) 90-days notice that the facility be relocated or formally abandoned in accordance with all City requirements.

Applicability:			
SD	RW	F	N
✓	✓	✓	✓
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2. If a utility does not respond within ninety (90) calendar days to a City notice as per subsection N.1 above, the City may declare the facility to be a nuisance obstructing public right-of-way pursuant to *Beaverton Code* section 5.05.115 and may abate the nuisance pursuant to *Beaverton Code* section 5.05.140.

#### N. Security for Performance and Maintenance

1. Bonds or similar security for performance and maintenance are required for all utility work performed under a City Site Development Permit or Right-of-way Permit. The security for performance shall be for the full amount of the work to be performed within the right-of-way, as estimated by the utility and approved by the City Engineer for general accuracy. The security for maintenance against defects in the permitted work shall be for 25 percent of the value of the work as built and shall be in effect for at least two (2) years following the City's written approval of the work. The City Engineer may require that the maintenance security remain in effect for a longer period, if the completed work is not in conformance with all City requirements.
2. If allowed by the permittee's franchise agreement with the City, the City Engineer may accept a combination performance and maintenance "blanket bond" or other type of "blanket" security for all utility work to be done by a single permittee at one or more locations or times in a calendar year (e.g., utility work that the permittee anticipates may be done under more than one permit). Said blanket security shall be in conformance with the requirements of the Site Development Ordinance, shall be for a period of up to one (1) year, and shall be in a form approved by the City Attorney. The blanket security shall be for the full amount of the work to be performed within the right-of-way, as estimated by the utility and approved by the City Engineer for general accuracy. If at any time during the effective period of a blanket security the total estimated cost of the permittee's uncompleted work is expected to exceed the original amount of the security, the City Engineer may require the permittee to increase the amount of the security accordingly. In addition, the City Engineer may review each blanket security upon its expiration, may determine whether a new security is required, whether the amount of the security is sufficient, and may require that the amount of the security be increased accordingly (e.g., if the scope or cost of the project has increased materially).

#### O. Additional Submittal Requirements

1. Organization and Content of Submittals for Utility Facilities.

Applicability:			
SD	RW	F	N
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- a. For private utility work that is to be a part of a new subdivision or other development, the permit submittals shall be in conformance with section 115 and subsection 210.18.O.2 of this manual.
  - b. For utility work that requires a Right-of-way Permit, the permit submittals shall be in conformance with section 115 and subsection 210.18.O.2 of this Manual. The construction plans shall be separate plan sheet(s) conforming to subsection 115.2 of this manual and subsection 210.18.O.2 below or as otherwise required by the City Engineer.
  - c. For utility work that requires a Facilities Permit, the permit submittals shall be in conformance with section 115 and subsection 210.18.O.2 of this Manual, with the exceptions listed in subsection 210.18.O.3 below, or as otherwise required by the City Engineer. The work shall be shown on separate plan sheet(s) in the permit submittals.
2. In addition to the minimum requirements set forth in section 115 of the *Engineering Design Manual* for plan submittals, the following items shall be additional minimum requirements for approval of engineering plans for utility construction work requiring a Site Development Permit or a Right-of-way Permit. Plans shall contain at least the following information (the City Engineer may request additional information):
- a. The business name of the utility that is constructing the proposed facilities and the name, address and telephone number of the utility's contact person, including an after-hours telephone number;
  - b. The name, address and telephone number of the utility contractor and the name and telephone numbers (office and mobile) of the contractor's contact person, including an after-hours telephone number;
  - c. The name, address and telephone number of the design firm that prepared the plans and the name and telephone numbers (office and mobile) of the design firm's contact person, including an after-hours telephone number;
  - d. The business name(s) of the utility or utilities that will use the proposed facilities and the names, addresses and telephone numbers of the utility's or utilities' contact person(s), unless ORS 757.270 et seq. applies;

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- e. In the Plan view, the locations and descriptions of proposed underground and aboveground conduits, conductors, and cables (for direct-bury cable);
- f. In the Plan view, the locations and descriptions of proposed underground structures, including vaults and other enclosures, including any drainage piping and power supply cabinets and conductors;
- g. In the Plan view, the locations and descriptions of proposed aboveground utility improvements, including cabinets, housings, pedestals and other enclosures, with their locations shown to scale;
- h. In the Plan view, the locations and descriptions of proposed utility poles;
- i. For those proposed underground utility facilities that will be installed in existing streets and will cross existing or planned future public utility facilities and private sewer service lines, a profile view showing the location, depth, size, type and number of proposed underground utility facilities, and to the extent the information is available or given to the utility by the City, the existing and planned future utility facilities (public and private) that are parallel with and within a three (3) foot radius of the proposed facilities, and showing in cross-section all existing and planned future utility facilities to be crossed by the proposed underground facilities based on the best as-built information available, regardless of the method of construction to be used for installing the proposed underground facilities (i.e., trench or trenchless construction);
- j. If multiple underground conduits are being proposed, typical cross-sectional views showing the location, depth, size, type and number of proposed underground and aboveground private utility facilities, regardless of the method of construction to be used for installing the proposed underground facilities (i.e., trench or trenchless construction);
- k. The method(s) of construction to be used for installing each run of underground utility lines (i.e., trench or trenchless [directional drilling] construction); and,
- l. Application fee as set forth in *Beaverton Code* section 9.05.032 and Resolution No. 3223 or subsequent resolution, unless otherwise prescribed in the applicant's franchise agreement with the City.

Applicability:			
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3. For a Facilities Permit, plan sheet(s), if required by the City Engineer, shall be in conformance with subsection 115.2., with the following exceptions:
  - a. The requirement of 115.2.A that plans be submitted on 24 x 36-inch plan sheets is optional. The plans may also be submitted on 11 x 17-inch or 8-1/2 x 11-inch sheets.
  - b. Subsections 115.2.D.1. and 115.2.D.2. are waived. (No Title sheet or composite utility plan are required.)
  - c. Subsections 115.2.D.3. through 115.2.D.8., 115.2.E. (preferred but not required), 115.2.G., and 115.2.I. are waived.
  - d. Subsections 115.2.1.2. through 115.2.1.4., 115.2.1.7. through 115.2.1.13., and 115.2.1.15. through 115.2.1.19. are waived.
  - e. Subsection 115.2.2 is waived. (Profile views are not required.)
  - f. Subsection 115.3 is waived. (A site grading plan is not required.)
  - g. Subsection 115.4 is waived. (Drainage calculations are not required.)
  - h. Subsections 115.5 and 115.6 are waived.
  - i. Subsections 210.18.O.2.i, .210.18.O.2.j and 210.18.O.2.l are waived. (Profile information, cross-sections and an application fee are not required)
4. If the method of construction identified in subsection 210.18.O.2.k. above must be changed or any other aspect of a proposed utility facility governed by these standards must be changed materially during construction, the permittee shall inform the City of the change(s). The permittee shall make a reasonable effort to inform the City of the change(s) in writing before proceeding with that aspect of the construction, but a revision of the Site Development Permit shall not be required unless the proposed facility is to be located in a newly paved or resurfaced street (an arterial or collector street that has been paved within the previous five (5) years or other street that has been paved within the previous three (3) years) and the proposed change will require a street cut, in which case section 210.19 will apply.
5. The proposed locations of the utility lines and other utility facilities shown in Site Development Permit or Right-of-way Permit submittals shall be

Applicability:			
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dimensioned in sufficient detail to allow the City to determine their proposed locations accurately in the field. Where the proposed utility facility is planned to be located five feet or less from an existing or planned future public utility facility, and upon completion of the proposed utility facility its actual location deviates from its planned location more than two (2) feet in the horizontal or more than one-half (0.5) foot in the vertical, and the deviation will cause a safety hazard, substantial maintenance difficulties, or substantial additional future construction costs for the City, the City may require the utility company to re-install the facility in its correct location or make other adjustments approved by the City, unless prior approval of said deviation was granted by the City in writing. Upon completion of construction, the utility shall provide the City as-built construction plans in accordance with subsection 210.18.P. below. The City's receipt of as-built construction plans containing deviations from the City-approved plans shall not constitute the City's approval of those deviations.

6. The requirements of section 160 of the *Engineering Design Manual and Standard Drawings* shall apply to any revisions of the City-approved construction plans for private utility facilities governed by Site Development Permits and Right-of-way Permits, including, but not limited to, descriptions of aboveground enclosures and the method of construction to be used for installing underground utility lines (i.e., trench or trenchless construction), except that if an unforeseen condition is encountered during construction and requires a revision of the approved Site Development Permit or Right-of-way Permit plans, as applicable, and to obtain the City's prior approval of the appropriate Permit revision would create a traffic disruption, a safety hazard or an unreasonable financial burden for the permittee due to a construction delay or other factors, the permittee may proceed with the work, but shall inform the City of the revision as soon as possible and shall promptly seek City approval of the Permit revision. However, nothing in this subsection constitutes a waiver of the requirements of the preceding subsection. Further, failure to comply with said section 190 and this subsection will be grounds for the penalty imposed under *Beaverton Code* section 9.05.032 for each incident of unapproved revision(s) in the approved permit plans.

#### P. As-built Drawings

1. In addition to meeting the requirements of subsection 115.8 regarding as-built drawings, as-built drawings for utility work governed by the Site Development Ordinance and these standards shall:

Applicability:			
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- a. Be submitted in a generally recognized format;
  - b. Show all material deviations from the original approved plans,
  - c. Indicate the location and depth of the completed facilities, and
  - d. To the extent practicable, be accurate to within plus or minus one (1) foot in the horizontal and plus or minus one-half (0.5) foot in the vertical for underground utility facilities, and to within plus or minus two (2) feet in the horizontal and plus or minus one (1) foot in the vertical for aboveground utility facilities.
2. Upon request, the City will provide a person any pertinent as-built information on existing utility facilities that the City has on file and is approved for public distribution.
  3. When the City, from any information available to it, discovers errors in as-built information provided by a utility, the City may require the utility to correct the as-built drawings for said facilities and to provide the City copies of the corrected drawings within a reasonable time after the City notifies the owner of the inaccuracies.
  4. As-built drawings for projects designed on a CAD system shall be submitted to the City in hard copy form (on Silver Halide Contact Mylar) and, with matching detail, in electronic form (on CD ROM disks). As-built drawings in electronic form shall be in AutoCAD (latest version) format (.dxf or .dwg), and shall be compatible with the City's Windows software. If GPS (Global Positioning System) measurements are used in the preparation of the as-builts, the locations of GPS-surveyed improvements shall be reflected in the as-builts as State Plane Coordinates corrected to the coordinates of the City's base station on Griffith Drive.
  5. Upon request by a private utility, the City may prepare the as-built drawings for the utility's facilities constructed under a City permit. In such cases, the City will prepare the as-built drawings from the utility's construction records within a reasonable time after completion of the construction of the utility facilities and receipt of said construction records from the utility. The requesting utility shall reimburse the City for the cost of preparing said as-built drawings on a time and materials basis separate from any franchise or permit fees.

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6. As City staff time and resources allow, the City may create and maintain as-built overall system maps for the private utilities that request such maps and reimburse the City for their preparation and maintenance thereafter. The City may deem such product proprietary and may recover its costs incurred in developing and reproducing the product as allowed by Oregon law. The City will include in the maps only the facilities of those private utilities that provide the City copies of their maps of their existing systems and provide financial support for the City's mapping program. The details of the City's private utility system mapping program shall be defined in interagency agreements between the City and the utilities.

#### Q. Requests for Exemptions

1. Requests for exemptions from the requirements of this section 210.18 require approval by the City Engineer. The procedures for processing such requests shall be the same as specified in section 145 Design Modifications, except in order for the City Engineer to grant an exemption, the following criteria must be met:
  - a. The specification or standard does not apply in the particular application, or
  - b. Topography, right-of-way, or other geographic conditions impose an economic hardship on the applicant and make compliance with the standard impractical, and an equivalent alternative that can accomplish the same design purpose is available and does not compromise public safety or accessibility for the disabled, or
  - c. A change to a specification or standard is required to address a specific design or construction problem which, if not enacted, will result in an undue hardship, or
  - d. The requested exemption is minor and, if granted, will not materially compromise public safety, accessibility for the disabled, community esthetics, the stability of adjacent property values, land use compatibility between proposed aboveground utility facilities and neighboring land uses, the capacity of the City's infrastructure, the cost-effective use of public rights-of-way, or the cost-effective construction, operation, maintenance and repair of the City's infrastructure, or
  - e. In cases where the applicant is claiming an economic hardship relative to a proposed aboveground facility and is proposing an equivalent

Applicability:			
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alternative for the proposed aboveground facility, and the proposed alternative can accomplish the same design objectives and will not compromise community esthetics, the stability of adjacent property values, land use compatibility between proposed aboveground utility facilities and neighboring land uses, the capacity of the City's infrastructure, the cost-effective use of public rights-of-way, or the cost-effective construction, operation, maintenance and repair of the City's infrastructure.

2. The City Engineer shall notify the applicant of the decision within fourteen (14) calendar days of receiving the applicant's request. The applicant may appeal the City Engineer's decision to the City Council.

### 210.19 Trenching and Street Cuts

This subsection applies to all trenching and street cuts performed within the City of Beaverton, regardless of whether the work requires a permit or not.

#### A. Prohibited Street Cuts

The City will not allow, without prior approval from the City Engineer and the Operations Director, any street cuts in newly paved or resurfaced streets (i.e., arterials paved within the previous five (5) years and other streets paved within the previous three (3) years (sometimes referred to as "moratorium streets"). The following is a list of exceptions to this policy. These exceptions do not require the City Engineer's approval; however, the appropriate documents must be submitted with the application for any street cut permit:

1. An arborist determines that boring would pose greater risk to a significant or protected tree than a conventional open street cut, and the applicant provides the City Engineer a letter documenting that determination; or
2. The engineer of record determines that the only possible vertical location of the line would be within the structural section ( i.e., the existing required aggregate base course) of the street and the applicant provides the City Engineer a letter documenting that determination; or
3. The street cut is in AC pavement and will be restored by a 2-inch deep grind and 2-inch thick (minimum) AC inlay. A transverse street cut shall also include a minimum of a 2-inch deep grind and 2-inch thick (minimum) AC inlay that extends for a distance equal to the street width from both sides of the trench, or an inlay with an alternative distance from both sides of the trench as required by the City Engineer to ensure that no settling or loss in pavement life is expected. A longitudinal street cut

shall also include a minimum of a 2-inch deep grind and new AC inlay that extends over the entire width of the street and over the entire length of the trench plus the street width beyond both ends of the trench, or an inlay with a 2-inch thickness (minimum) with larger dimensions as required by the City Engineer, to ensure that no settling or loss in pavement life is expected. On street cuts for excavations over ten (10) feet deep, and on street cuts for excavations over five (5) feet deep that are in weak pavement sections, severely deteriorated pavement, poor soils, saturated soils, or high groundwater, the City Engineer may require the owner or developer to retain the services of an engineer specializing in pavement design to analyze the inlay requirements, recommend inlay dimensions that will ensure that no settling or loss in pavement life is to be expected, document the analysis with supporting data in a written report bearing the engineer's seal, and submit the report to the City Engineer for approval.

A permittee may apply for additional exceptions by submitting a formal request for a Design Modification to the City Engineer in accordance with section 145 Design Modifications of this Manual.

#### B. Requirements for Street Cuts and Pavement Restoration

##### 1. General.

- a. Street cuts and pavement restoration (repair and resurfacing/replacement) shall be in conformance with this section 210.19, the Standard Drawings for street cuts, the conditions of the permit and the current requirements of other agencies.
- b. The final cut of existing pavement shall be a "T-cut" (also known as a T-section or cutback), in which the existing pavement is cut back a specified distance away from the edge of the excavation as shown on the Standard Drawings for street cuts except that circular street cuts 12-inches or less in diameter do not require T-cuts.
- c. The minimum dimensions of any initial street window cut for an exploratory excavation shall be two (2) feet by two (2) feet, except that the minimum size for street cuts for potholes using non-destructive vacuum excavation shall be one (1) foot in diameter.
- d. If a street cut is parallel with, and less than three (3) feet from an existing curb or curb-and-gutter, the permittee shall remove the existing pavement within the street cut and the intervening existing pavement between the street cut and the curb or curb-and-gutter using a T-cut that encompasses the entire area of pavement that has been removed, and shall replace the removed pavement in accordance with this Manual and the Standard Drawings.

- e. If a street cut is parallel with, and less than five (5) feet from another street cut made by the permittee or a visible, pre-existing street cut that shows signs of distress determined to be unacceptable by the City Engineer, the permittee shall remove the existing pavement in the two street cuts and the existing pavement between the two street cuts using a T-cut that encompasses the entire area of pavement that has been removed, and shall replace the removed pavement in accordance with this Manual and the Standard Drawings.
- f. All street cuts shall be in a straight line and to a vertical plane. The cut lines shall be parallel to the centerline of the trench and shall be neat, straight and vertical.
- g. Irregularly shaped (non-rectangular or non-circular) street cuts and street cuts with more than four (4) sides will be allowed only with the express approval of the City Engineer.
- h. A street cut that will be partially or wholly within an existing pavement patch will not be allowed unless the street cut is widened to include the entire width of the existing patch.
- i. A street cut within five (5) feet of two or more valve box covers, manholes covers, grates or other castings, or combinations thereof, in the street shall encompass all of those castings that are within five (5) feet or less of another casting.
- j. Angles in T-cut Lines. The number of angles in a final pavement cut shall be kept to a minimum. At intersecting pavement cut lines, no angle shall be less than 75 degrees, unless expressly approved or required by the City Engineer.
- k. Marking T-cuts and Approval by City Inspector. Before the final pavement cuts for the permanent resurfacing are made, the boundaries of the T-cuts shall be marked with white spray paint and must receive the approval of the City inspector.
- l. Contiguous Street Cuts. To ensure the structural integrity of the pavement, at each location where a permittee has made two (2) or more contiguous street cuts (i.e., trenches or window excavations), or a combination thereof, the City Engineer may require final pavement cuts and restoration in a single rectangular area that encompasses the contiguous intersecting street cuts and may also require an AC inlay in that rectangular area.
- m. T-cut lines for trenches that are twelve (12) inches wide or less shall be a minimum of six (6) inches outside the excavation's walls. T-cut lines for trenches that are more than twelve (12) inches wide shall be a minimum of one (1) foot outside the trench walls, except that the City Engineer may require T-cuts to be further outside the trench walls if the trench walls are widened after the initial cut due to sloughing, additional excavation or other causes, in which case the City

Engineer may require the T-cuts to be widened to more than one (1) foot outside the trench walls as required to reach undisturbed, stable subgrade. In such cases, the permittee shall remove the additional pavement and replace the entire area of removed pavement in accordance with this Manual and the Standard Drawings entirely at the permittee's expense.

## 2. AC Pavement Street Cuts.

- a. Street cuts in AC pavement shall be in accordance with sections 210.19.A and 210.19.B.1, the following requirements and the Standard Drawings for street cuts in PCC streets, unless otherwise directed by the City Engineer.
- b. The minimum dimensions of the final street cut for a trench in AC pavement will be greater than the size of its initial cut because the City requires that all final cuts be T-cuts, which are outside the initial street cut.
- c. Cutting Methods. In AC pavement, all initial pavement cuts (cuts prior to excavation) shall be made by jackhammering, sawcutting or grinding. Final cuts (T-cuts) shall be by grinding or sawcutting, except that for AC overlays and inlays, the final cutting shall be done only by milling or grinding with a drum grinder.

## 3. PCC Concrete Pavement, Sidewalks, Curbs and Curb-and-Gutter Cuts.

- a. Street cuts in PCC pavement, driveways and sidewalks shall be in accordance with sections 210.19.A and 210.19.B.1, the following requirements and the Standard Drawings for street cuts in PCC streets, unless otherwise directed by the City Engineer.
- b. On PCC-paved Arterial streets and non-Arterial streets that are bus routes or truck routes, the minimum pavement restoration shall be full panel replacements of all cut panels and all damaged panels.
- c. On PCC-paved non-Arterial streets that are neither bus routes nor truck routes, a minimum pavement restoration area that is less than full panel (partial panel) replacement may be approved by the City Engineer unless one or more of the following conditions exists:
  - (1) Unstable subgrade conditions. The street cut is in an area of pavement with subgrade that is known to be unstable or frequently saturated from subsurface drainage and the City Engineer requires full panel replacement to compensate for such subgrade conditions.
  - (2) Removal of more than fifty percent (50%) of a panel: In any panel where the cut removes (or requires removal of) more than 50% of the panel.

- (3) Cuts in the Central Business District (CBD): Where a street cut or multiple street cuts in the same panel in a street in the Central Business District remove an area of pavement or multiple areas of pavement the cumulative area of which is more than twenty-five percent of the panel's area.
  - (4) Diagonal Cuts: Any diagonal cut that is not parallel to a diagonal panel joint will require full panel replacement.
  - (5) Cuts leaving a panel in three (3) pieces: Where a proposed cut will leave a panel in three or more pieces, the entire panel shall be removed and replaced.
- d. Less than Full Panel (Partial Panel) Replacement. Partial panel replacement will be allowed if the cut is not in an Arterial street, bus route or truck route or if the cut is entirely within the median lane or center turn lane of an Arterial street, bus route or truck route, and if none of the conditions listed in section 210.19.B.3.c. above exist. Except for window cuts for exploratory excavations that are two (2) feet or less in length and width, if the cut is entirely within the median lane or center turn lane of an Arterial street, bus route or truck route, in order for the cut to be allowed, it must first meet the following criteria:
- (1) The cut must be a longitudinal cut that is at least 100-feet long and at least six (6) feet wide, and
  - (2) One edge of the cut must be on one of the lane lines along its entire length, and
  - (3) The cut must remove less than 50 percent (50%) of the panel width at all points, and
  - (4) Both ends of the cut must be at least 200-feet from the nearest intersections on each end (as measured from the intersecting centerlines of the intersection.), and
  - (5) The cut must be three (3) feet or more from an existing longitudinal joint or five (5) feet or more from an existing transverse joint, any other patches (new or existing) or any existing cracks in the panel being cut that are determined by the City Engineer to require removal and replacement.

Initial street cuts in other roadways, except window cuts for exploratory excavations, shall be six (6) feet by six (6) feet, minimum.

- e. Additional Panel Removal. If the initial cut is less than three (3) feet from a longitudinal joint or five (5) feet from a transverse joint or other patches (new or existing) or cracks, the intervening portion of the panel must be removed.

- f. Pavement Panels with Curbs. If the edge of the initial cut is less than thirty-six (36) inches from the face of a curb, the intervening portion of the panel and curb must be removed and replaced.
- g. Pavement Replacement on Edges of Panels without Curbs: Pavement replacement on the longitudinal (outside) edge of panel without a curb shall be a minimum of three (3) feet in width.
- h. Additional Responsibility. If any pavement between the cut and the nearest joint, crack, or another cut, as described above, becomes disturbed or unserviceable before the time of restoration, it must be removed and replaced entirely at the permittee's expense.
- i. Saw cutting. The minimum depth of any saw cut on PCC pavement or on asphalt over PCC pavement shall be in accordance with the Standard Drawings for street cuts. Subsequent removal shall be accomplished by using a jackhammer. The use of a machine utilizing a falling or swinging weight (a "head-ache ball") will not be permitted. No cutting wheel runout will be permitted beyond the limit of the opening of the cut or on adjacent panels on arterials, bus routes and truck routes. The slurry resulting from the cutting operation shall be contained, collected and disposed at an appropriate disposal site. No such material shall be disposed of in any storm drain system.
- j. Jackhammers and Line Drilling. Use of Jackhammers and line drilling is authorized (for initial cuts only) providing the holes shall be one and one-half (1-1/2) inches in diameter, and the maximum spacing between holes shall be six (6) inches, center to center. The holes shall be drilled perpendicular to the base and completely through the pavement.
- k. Direction of Cuts. Cuts shall be made parallel and/or perpendicular to longitudinal and transverse joints.
- l. Cut Enlarged by City. If the cut conforms to the above rules and the Department removes additional pavement, the replacement of the additional portion of the panel shall be at the expense of the City. Note: The application of these rules may sometimes require the replacement of more than fifty percent (50%) of a pavement panel requiring full panel replacement, even though the initial cut itself covered less than fifty percent (50%).
- m. Damage to Adjacent Panels. If an existing PCC pavement panel adjacent to a street cut is spalled, chipped, cracked, uplifted, tilted, undermined, depressed or otherwise damaged during construction, it shall be replaced in its entirety by the permittee entirely at the permittee's expense.

- n. Sidewalk cuts. The minimum cut in a concrete sidewalk shall be one full sidewalk panel.
  - o. Structural Failure of and Damage to Restored PCC Pavement. Restored PCC pavement, whether full panel or partial panel, that fails structurally or is damaged prior to the end of the maintenance period shall be replaced completely. See section 210.19.B.13 for additional requirements.
  - p. Cutting Methods. In streets other than arterials, collector streets, bus routes and truck routes, the final cut of PCC concrete pavement, curbs, curb-and-gutter and sidewalks shall be sawcut to a minimum depth of four (4) inches or half the concrete thickness, whichever is greater. Subsequent removal may be accomplished by using a jackhammer. The final pavement cut shall be ground or sawcut, as applicable, consistent with these standards. The pavement shall be cut in a straight line and to a vertical plane, regardless of the shape or condition of the initial cut. The cut lines shall be parallel to the centerline of the trench and shall be neat, straight and vertical. Full-depth sawcutting and doweling may be done at the permittee's option, per the Standard Drawings, at the permittee's expense. The use of a machine utilizing a falling or swinging weight (a "head-ache ball") will not be permitted. If an existing PCC pavement panel adjacent to a street cut is spalled, chipped, cracked, uplifted, undermined, depressed or otherwise damaged during construction, it shall be replaced in its entirety by the permittee entirely at the permittee's expense.
  - q. Re-cutting Unsatisfactory Cut Edges. Prior to resurfacing (patching), if the ground or sawcut face of a final cut is spalled, jagged, frayed, cracked, uplifted, undermined, depressed or otherwise unsatisfactory, the City may require the cut to be re-done by sawcutting in sound pavement up to twelve (12) inches from the edge, in continuous straight cuts, which shall be done by the permittee entirely at the permittee's expense, unless otherwise agreed to by the City and the permittee in accordance with subsection 210.19.C.10 below.
4. Temporary Pavement Patching and Steel Plating. Pavement restoration shall be as required by this section and the approved plans. After the trench has been backfilled, the pavement may be patched temporarily by using cold mix AC or bridged over by steel plates. (Exception: Circular cuts in AC pavement shall be patched temporarily only with hot mix asphalt concrete. Cold patches are not allowed.)
- a. Pavement repairs made to emergency excavations will be considered temporary and must be inspected and restored in accordance with the requirements for final pavement cuts and permanent pavement restoration hereinafter.

- b. Permanent replacement of pavement, curb, curb-and-gutter, sidewalk and driveway cuts shall be completed within thirty (30) calendar days from the date the pavement is initially cut, unless an extension is granted by the City Engineer for inclement weather or other adverse conditions.
- c. If cold mix asphalt is used as a temporary patch, the compacted thickness of the cold mix shall be at least two (2) inches. The contractor shall monitor the patch and maintain a smooth driving surface by promptly correcting any irregularities in the pavement surface that deviate from the proper street grade or cross-section by plus or minus one-quarter (1/4) inch or more. All temporary patches shall be replaced with a permanent resurfacing no more than thirty (30) calendar days after the pavement is cut, provided the applicant makes daily inspections and makes any necessary repairs on a timely basis. If the temporary patch is not monitored and maintained, or if the temporary patch creates uncomfortable driving conditions, the City Engineer may shorten the thirty (30) day time limit to as few as fourteen (14) calendar days. If the temporary patch creates unsafe driving conditions, the City reserves the right to shorten the time limit as conditions warrant.
- d. If steel plates are used, they shall be secured firmly to the pavement with cold mix around their perimeter so that they do not move horizontally, rattle, bounce or make unnecessary noise. If a steel plate becomes detached from the pavement or makes unacceptable noise, the Contractor shall take remedial action promptly, and if notified by the City of same, shall take remedial action within four (4) hours or less. If a steel plate becomes detached from the pavement repeatedly, the City may require the Contractor to secure said steel plate to the pavement with anchors and/or bolts. Steel plates may be used for a maximum of fourteen (14) calendar days, at the end of which the contractor shall complete permanent restoration of the pavement. If requested by the permittee, the City Engineer may grant an extension of this time frame for inclement weather or other adverse conditions.

#### 5. Restoration of Damaged Adjacent Pavement.

- a. Before paving, the City Engineer may require the permittee to expand the pavement restoration area and T-cut beyond one (1) foot from the initial cut lines, at no additional expense to the City, and require the permittee to repair subsidence, rutting, cracks, gouges, punctures, contamination and other damage to the adjacent pavement that occurred after the permittee's initial pavement cut.
- b. If any pavement between the cut and the nearest joint, crack or other cut becomes disturbed or unserviceable before the time of restoration, and prior to the end of the performance period, it shall be removed and replaced by the permittee entirely at the permittee's expense.

6. Backfilling. All backfilling shall be in conformance with this and other sections of this manual and the Standard Drawings.
  - a. All approved rectangular street cuts that are twelve (12) inches wide or less and in streets of a higher functional classification than “local” shall be backfilled with approved Controlled Density Fill (CDF).
  - b. All approved rectangular street cuts that are twelve (12) inches wide or less and in streets classified as residential or local streets may be backfilled with compacted clean sand, compacted crushed rock aggregate backfill material or approved CDF. A permittee desiring to use CDF must submit a written request to the City and obtain the City's prior approval in writing.
  - c. All other approved street cuts shall be backfilled with compacted crushed rock aggregate backfill material except as may be approved or required otherwise by the City Engineer, except that circular or “keyhole” cuts shall be backfilled with compacted clean sand, CDF, or approved lean concrete for the entire depth of the core below subgrade.
  - d. In narrow trenches that are wider than twelve (12) inches, the permittee may substitute CDF for crushed aggregate backfill with the express approval of the City Engineer.
7. Approval of Final Pavement Cuts/T-cuts. The City inspector must approve the edges and corners of final pavement cuts/T-cuts before permanent pavement reconstruction may proceed. If the edge or corner of the final pavement cut, or the face, edge, or surface of the pavement immediately adjacent to the final pavement cut/T-cut, becomes deteriorated, deformed, rolled (rounded), depressed, undermined, dirty, contaminated, raveled, cracked, unsound or damaged in any way that, in the City inspector’s opinion, might interfere with the proper bonding of the new asphalt to the existing asphalt, interfere with proper sand sealing of the joint, or create an irregular pavement surface at the joint, the City inspector may require re-sawcutting of the existing pavement along a new cut line that is further from the initial street cut, at no expense to the City. If required by the City inspector, irregular edges of pavement cuts shall be prepared by the permittee for permanent resurfacing by either grinding the edges smooth or sawcutting a new, smooth edge before resurfacing.
8. Pavement Restoration after T-cuts. The restoration of pavement after T-cutting shall be in accordance with the Standard Drawings for street cuts, as applicable, and the additional requirements below:
  - a. AC Surfacing on Flexible Base: The compacted thickness of the permanent AC pavement resurfacing shall be at least two (2) inches thicker than the original AC up to a maximum total thickness of four (4) inches in local streets and

neighborhood routes and six (6) inches in collectors and arterials, unless the City Engineer requires a thicker pavement section. The top two (2) inches of the AC resurfacing (the AC wearing course) shall be constructed of Class "C" hot mix AC compacted to 91 percent of theoretical maximum density (Rice), and the underlying AC base course shall be Class "B" or "C" hot mix AC compacted to 91 percent of theoretical maximum density (Rice). The AC shall be placed in a minimum of two (2) lifts, with the maximum thickness of any one lift not exceeding two and one-half (2-1/2) inches. The Rice theoretical maximum density shall be as determined in conformance with AASHTO T209, as modified by ODOT.

- b. Full-depth AC Pavement on Compacted Subgrade: The compacted thickness of permanent AC pavement resurfacing replacing existing full-depth AC pavement shall be at least two (2) inches greater than the original AC's thickness, unless the City Engineer requires a thicker pavement section of up to a maximum of four (4) inches greater than the original thickness. The top two (2) inches of the AC resurfacing (the AC wearing course) shall be constructed of Class "C" hot mix AC compacted to 91 percent of theoretical maximum density (Rice), and the underlying AC base course shall be Class "B" or "C" hot mix AC compacted to 91 percent of theoretical maximum density (Rice). The AC shall be placed in a minimum of two (2) lifts, with the maximum thickness of any one lift not exceeding two and one-half (2-1/2) inches. The Rice theoretical maximum density shall be as determined in conformance with AASHTO T209, as modified by ODOT.
- c. AC Surfacing on Cement Treated Base (CTB) or portland cement concrete (PCC) Base. CTB and PCC base courses shall be replaced with new PCC pavement conforming to section 210.2.4. The thickness of the PCC base replacing the original base shall be at least two (2) inches thicker than the original base, but not less than eight (8) inches thick in any case. The AC wearing course shall conform to the requirements for AC wearing course and base course in the preceding subsection.
- d. Full-depth PCC Pavement. The permanent resurfacing for full-depth portland cement concrete pavement shall be new full-depth PCC pavement that is two (2) inches thicker than the original pavement it is replacing, but not less than eight (8) inches thick in any case. The permanent PCC resurfacing shall be high early strength 5,000 p.s.i. concrete and shall be constructed in accordance with subsection 210.2.4. In addition, Fibermesh by Synthetic Industries, Inc. and Eclipse concrete shrinkage reducing agent by Grace Construction Products shall be incorporated into the PCC resurfacing in accordance with the manufacturers' recommendations.

9. Replacement to Proper Grade and Cross-section. When existing pavement abutting a curb or curb-and-gutter is removed and restored, the gutter's existing/original grade and cross-section shall be maintained (matched) except that when the existing/original pavement did not drain properly and exhibited areas of localized ponding (i.e., a "bird bath"), such areas of ponding shall be eliminated when the pavement is restored. The City Engineer shall provide documentation of said ponding upon request from the permittee. Elsewhere, the surface of the final resurfacing shall match the existing/original pavement's grade and cross-section, except that a patch or inlay may increase the height of the street's crown and the street's cross-slope if expressly approved by the City Engineer. When existing structures such as manholes, catch basins, concrete curb-and-gutter, and valve boxes are within the area to be resurfaced and are to be preserved, the resurfacing shall match the top of the existing finished grade of these facilities unless otherwise required or approved by the City Engineer.
10. City Request for Additional Resurfacing. If the existing pavement adjacent to a street cut has failed or is defective with respect to surface quality, structural condition, grade, cross-section or any other aspect before the work begins, by no fault of the permittee, or is damaged during the work by no fault of the permittee, the City Engineer may request the permittee to expand the pavement restoration area, at the City's expense, to correct high or low spots in the pavement surface or to repair deteriorated or damaged pavement, and to replace pavement markings and stripes removed from the expanded restoration area. The permittee may decline such request without penalty.
11. Replacement of Existing Driveways, Sidewalks, Curb, Curb-and-Gutter, Castings and Structures. Existing driveways, sidewalks, curb, curb-and-gutter, castings and structures that are to be preserved but have been removed by the permittee or its excavator shall be replaced with the same material or better as required to meet current construction standards, and to the same section, width, depth, surface texture, color and finish, line and grade as that removed unless current standards require otherwise. If high early strength concrete is being used in restoring pavement that is adjacent to other PCC concrete improvements that must be restored, the same concrete mix shall be used in reconstructing the other PCC concrete improvements, if all of the concrete can be poured successively without additional expense other than the additional cost of the high early strength concrete. Damaged sidewalk ramps shall be reconstructed in accordance with current ADA requirements. Broken or jagged ends of existing concrete shall be sawcut on a straight line and to a vertical plane. Prior to replacing the concrete sections, the subgrade shall be backfilled to proper grade and cross-section and compacted to 95 percent AASHTO T-99 to prevent subsequent settlement. All concrete replacement work shall be completed prior to the placement of adjacent AC resurfacing.
12. Joints in Permanent AC Resurfacing. Tack coat shall be emulsified asphalt grade CSS-1 and shall be applied to the existing pavement, existing curb or gutter, and edges

of sawcuts and grinds as specified in the *Oregon Standard Specifications for Construction*. After the resurfacing and inlay areas are permanently paved and rolled, the joints shall be sand sealed the same day with paving asphalt cement, grade AR4000W, or CSS-1 emulsified asphalt, and dry paving sand, which shall be applied before the asphalt cement solidifies. If the joints are not sand sealed the same day, the Contractor shall seal the joints with crack sealing compound, cold or hot pour type, conforming to ASTM D3405. All sand sealed joint surfaces and crack-sealed joint surfaces shall be smooth and flush with the adjacent pre-existing pavement surface. There shall be no bumps, dips or noticeable roughness in the riding quality of the completed resurfacing.

13. Surface Smoothness. The surface smoothness of pavement, driveways, sidewalks, monolithic curb-and-gutter, and barrier curbs restored by the contractor (i.e., the permanent resurfacing) shall conform to the *Oregon Standard Specifications for Construction*. Resurfaced pavement shall provide motorists a smooth, quiet ride equal to or better than the original pavement. Resurfacing that does not meet these requirements shall be corrected only by removing the resurfacing by sawcutting and re-paving the unacceptable area.
14. Correction of Defective Work.
  - a. General. If a street cut is repaired and the replacement pavement fails to meet the pavement mix requirements, compaction requirements, surface smoothness requirements or any other pavement requirements of this *Engineering Design Manual* or permit conditions upon completion of the pavement repair, or anytime within a period of two (2) years thereafter, the defective pavement shall be replaced by the permittee entirely at the permittee's expense.
  - b. Defective Restored AC Pavement. In addition to removal of the area of defective pavement, a new, wider "corrective" T-cut and removal of the entire original restoration area in which the defect exists and for a minimum distance of twenty-five (25) feet beyond the defective restoration area longitudinally in both directions and three (3) feet transversely outside the original T-cut area in both directions or nine (9) feet in width, whichever is greater, will be required, unless expressly approved or required otherwise by the City Engineer.
  - c. Defective Restored PCC Pavement. Replaced PCC pavement shall be deemed "defective" if it does not meet the above requirements, does not drain properly, does not meet or exceed the required compressive strength or other material specifications, or if it exhibits temperature cracks, excessive shrinkage cracks, structural failure (breakage), spalling, gouging, differential settlement, edge chipping at joints, defective joints or unsightly damage due to external causes. Replacement of a defective area of a PCC pavement panel shall be no smaller than the entire original restoration area of the panel in which the defect exists, up to the

full panel, as determined by the City Engineer. Defective PCC in more than one panel of an Arterial street, bus route or truck route will require full panel replacement of all those panels containing defective pavement. The minimum dimensions of T-cuts in PCC pavement, driveways and sidewalks shall be in accordance with sub-section the Standard Drawings for PCC street cuts, unless otherwise directed by the City Engineer. The PCC concrete used in replacing defective concrete shall have the same color, same finish, same joint pattern, same panel size, shall match the existing concrete that was replaced in all other respects, and shall meet the City's standards that are current when the defective concrete is replaced, except as may be allowed or required otherwise by the City Engineer.

15. Corrective AC Pavement Inlays. In addition to subsection 14. immediately above, in existing AC pavement that is more than one year old, certain types of street cuts, if not restored properly, can shorten the service life of the existing pavement excessively. Therefore, if the AC pavement restored by the permittee fails upon completion of the pavement restoration or anytime within a period of two (2) years thereafter, the City Engineer may require the permittee to reconstruct the pavement as required in subsection 210.19.B.14. and, in addition, construct a pavement inlay over the failed area, and for a distance of twenty-five (25) feet beyond the defective restored pavement in both directions longitudinally, to ensure the structural integrity of the pavement in the restoration area and the adjacent existing pavement.

- a. If AC replacement pavement does not continue to meet the AC pavement requirements of this *Engineering Design Manual* for a period of two (2) years after completion of the pavement repair, and the street cut falls into any of the categories listed under the heading "Description of Street Cut" in the table below, then in addition to a wider, corrective T-cut in the failed restoration area and replacement of the failed pavement section as specified in subsection 210.19.B.14., the City Engineer may require the permittee to grind the pavement and construct a pavement inlay throughout the area of defective pavement restoration.
- b. If the City Engineer requires a corrective inlay, the permittee shall, in accordance with the T-cut and reconstruction requirements above, remove the top two (2) inches of the existing pavement by grinding and construct an inlay of Class "C" AC in the pavement reconstruction areas specified in the table below:

## CORRECTIVE INLAY REQUIREMENTS

TYPE OF STREET CUT	AREA OF CORRECTIVE T-CUT AND PAVEMENT RECONSTRUCTION REQUIRED	AREA OF TWO (2) INCH DEEP (NOMINAL) GRINDING AND PAVEMENT INLAY REQUIRED
(1) Street cut is three (3) feet or less from existing curb or edge of pavement	<ul style="list-style-type: none"> <li>a. The area of existing pavement that is within the new street cut, plus</li> <li>b. The area of existing pavement that is between the street cut and the curb or edge of pavement, plus</li> <li>c. The area of existing pavement that is outside and adjacent to the street cut and is at least three (3) feet from it in all directions.</li> <li>d. Per Standard Drawings.</li> </ul>	<ul style="list-style-type: none"> <li>a. The area of existing pavement that is outside, adjacent to, and within at least one (1) foot of the corrective "T" cut area.</li> <li>b. Per Standard Drawings.</li> </ul>
(2) Street cut is five (5) feet or less from another street cut (includes another new street cut and a visible pre-existing street cut)	<ul style="list-style-type: none"> <li>a. The area of existing pavement that is within the new street cut, plus</li> <li>b. The area of existing pavement that is between the two street cuts, plus</li> <li>c. The area of existing pavement that is outside the street cuts and is at least three (3) feet from them in all directions.</li> <li>d. Per Standard Drawings.</li> </ul>	<ul style="list-style-type: none"> <li>a. The area of existing pavement that is outside, adjacent to, and within at least one (1) foot of the corrective "T" cut area.</li> <li>b. Per Standard Drawings.</li> </ul>
(3) Series of two or more longitudinal street cuts along the same axis of which two or more are less than fifteen (15) feet apart	<ul style="list-style-type: none"> <li>a. The area of existing pavement that is within the new street cut, plus</li> <li>b. The area of existing pavement that is between the street cuts, plus</li> <li>c. The area of existing pavement that is outside all of the street cuts and is at least three (3) feet from them in all directions.</li> </ul>	<ul style="list-style-type: none"> <li>a. The area of existing pavement that is outside, adjacent to, and within at least one (1) foot of the corrective "T" cut areas, plus</li> <li>b. The area of existing pavement that is fifteen (15) feet longitudinally beyond the ends of the end street cuts.</li> </ul>
(4) Two (2) or more parallel or transverse street cuts, or two (2) or more small street cuts in succession along the same axis, any two or more of which are less than fifteen (15) feet apart longitudinally or transversely.	<ul style="list-style-type: none"> <li>a. The area of existing pavement that is within the new street cuts, plus</li> <li>b. The area of existing pavement that is between the street cuts that are less than fifteen (15) feet apart, plus</li> <li>c. The area of existing pavement that is outside the all of the street cuts and is at least three (3) feet from all of them in all directions.</li> </ul>	<ul style="list-style-type: none"> <li>a. The area of existing pavement that is outside, adjacent to, and within at least one (1) foot of the corrective "T" cut areas of the street cuts that are less than fifteen (15) feet apart, plus</li> <li>b. The area of existing pavement that is between</li> </ul>

TYPE OF STREET CUT	AREA OF CORRECTIVE T-CUT AND PAVEMENT RECONSTRUCTION REQUIRED	AREA OF TWO (2) INCH DEEP (NOMINAL) GRINDING AND PAVEMENT INLAY REQUIRED
		<p>the street cuts that are less than fifteen (15) feet apart, plus</p> <p>c. The area of existing pavement that is fifteen (15) feet longitudinally beyond the transverse edges of the end street cuts.</p>
<p>(5) Intersecting street cuts, including new street cuts intersecting other new street cuts and new street cuts intersecting visible, pre-existing street cuts, window cuts or pot-holes that are larger than 20 square feet in area</p>	<p>a. The area of existing pavement that is within the new street cuts, plus</p> <p>b. The area of existing pavement that is outside and adjacent to the new street cuts and is at least three (3) feet from all of them in all directions, plus</p> <p>c. The area of additional existing pavement that is necessary to form a single rectangular inlay shape that encompasses the intersecting street cuts at their longest and widest parts.</p>	<p>a. The area of adjacent existing pavement that is outside, adjacent to and within at least one (1) foot of the corrective "T" cut, plus</p> <p>b. The area of existing pavement that is within the full width of any travel lanes that have been encroached upon by a new street cut area covering fifty (50) percent or more of their width.</p>

- c. Pavement grinding shall be the minimum width necessary for a paving machine to be used for repaving, but shall be limited in maximum width to keep the impacts and cost of pavement restoration reasonable. Unless expressly permitted otherwise by the City Engineer, pavement grinding and inlays shall not be less than nine (9) feet wide nor more than thirteen (13) feet wide, except that where two or more adjacent travel lanes are affected, the City Engineer may require the grinding and inlay to exceed thirteen (13) feet in width.
- d. Inlays shall fill the entire area of the grind and shall have a compacted thickness of at least two (2) inches. The surface of the compacted inlay shall match the surface of the existing pavement at its edges, and the thickness of the inlay shall exceed the depth of the grind where required to produce a smooth, properly graded driving surface, up to a maximum thickness of two and one-half (2-1/2) inches, which shall be entirely at the permittee's expense. If a smooth, properly graded driving surface cannot be achieved with a two and one-half (2-1/2) inch thick inlay, the City Engineer may request additional thickness as provided in subsection 210.19.B.8.

The additional cost of additional AC that is in excess of two (2) percent of the total cost of the AC used in the inlay shall be borne by the City, providing such additional AC is not required as a result of defective work by the permittee.

- e. If a corrective inlay is required, the permittee is responsible for all grinding, inlays, adjusting the height of all affected existing structures and castings, and replacing pavement markings and stripes removed for the street cut, all of which shall be done by the permittee entirely at the permittee's expense unless the work is being performed under a City contract and the pavement cuts are required by the construction plans and specifications.
- f. If an inlay is required, the permittee may elect as an alternative, entirely at the permittee's expense, to sawcut the full depth of the pavement section for the full length and width specified above, rather than grinding only the top two (2) inches of the existing pavement. If the permittee so elects, the thickness of the permanent resurfacing shall be at least as the minimum thickness specified in subsection 210.19.B.8.

#### 16. Conformance with Other City Standards.

Replacement of damaged pavement, driveways, sidewalks, sidewalk ramps, curb, curb-and-gutter, and other damaged improvements shall be in accordance with all other applicable City standards, including without limitation those standards for materials, construction procedures, weather conditions, ground temperature, air temperature, asphalt mix temperature and all others. Material testing is required for backfill, aggregate base, AC pavement, PCC concrete pavement, concrete driveways, sidewalks, curb, and curb-and gutter. Compaction shall be as specified elsewhere in the City's standards. If pipe, conduit, backfill, aggregate base, compaction, pavement, sidewalk or driveway replacement, or any other work does not meet City standards and the defective work is expressly, conditionally allowed to remain by subsection 210.2.2 or another standard, or if the defect is minor and immediate correction is not required by the City Engineer, the City Engineer may require an Extended-period Maintenance Warranty for a period of up to five (5) years and in the amount of 100 percent of the City Engineer's estimate of the cost of correcting the defective work by competitive bid contracting, including without limitation construction, engineering, administration, inflationary costs, permits and other appropriate costs.

#### C. Controlled Density Fill (CDF)

- 1. The use of approved CDF as trench backfill is an approved method of backfill that the City Engineer may require or allow in lieu of aggregate or native materials as specified elsewhere in this document.

2. Approved street cuts to be backfilled with CDF (also referred to as “flowable fill”) shall be backfilled with CDF conforming to Section 00442 of the *Oregon Standard Specifications for Construction* as modified herein. Only CDF approved by the City Engineer shall be used for backfilling.
3. CDF shall not be used for lengths greater than 100 feet. Should the required trench exceed 100 feet, then the City will determine where CDF will be required on a case-by-case basis. When CDF is used, at a minimum, pipe and conduit bedding and pipe/conduit zone material shall be  $\frac{3}{4}$ -inch minus aggregate. In addition, the top 12 inches of the trench backfill (below the pavement) shall also be  $\frac{3}{4}$ -inch minus aggregate to allow subgrade drainage.
4. CDF shall be designed for a minimum compressive strength of 50 psi, a maximum compressive strength of 100 psi in 28 days, and a maximum compressive strength of 150 psi in 90 days. The maximum size of the aggregate shall be  $\frac{3}{4}$ -inch of which the mix design shall not contain more than 25 percent by weight.
5. The Engineer of record (or designee) shall be on site while the CDF is being placed in order to ensure that the proper mix is supplied and to ensure that the above minimum drainage requirements are met and, if subsurface drainage is excessive, to instruct the contractor to increase the depth of the  $\frac{3}{4}$ -inch minus aggregate to ensure adequate subgrade drainage, especially in conditions where cross drainage occurs (at the low point of sag vertical curves, for example).
6. CDF shall be field tested by an independent laboratory per ASTM PS 28, 29, 30, and D 4832 standards (the field technician shall be ACI Certified or equivalent). The Engineer of Record and the independent laboratory shall record: the name of the supplier (the engineer of record shall include with the daily report a copy of all batch tickets), the temperature of the air, ground, and mix (at time of placement), the weather conditions, ground water conditions, other utilities encountered, and any other information which may affect the material. At a minimum four cylinders shall be taken for each trench and other separate excavation and for each one hundred (100) linear feet of trench for trenches that are in excess of one hundred (100) feet long, and for each different mix used. These cylinders shall be broken one at 7 days, one at 28 days, and one at 90 days with one reserve cylinder.
7. Prior to paving, the CDF shall be tested per ASTM PS 31 by the independent laboratory.
8. All test reports shall be sent to the City Inspector, the engineer of record, and the supplier. If the test results do not meet the requirements of this subsection 210.19, the City shall reject the unacceptable CDF. If the City rejects the CDF, the permittee shall remove the rejected CDF and replace the rejected CDF and the pavement above it with approved material and pavement entirely at the permittee’s expense.